Express in simplest form: \((3x^2 + 4x - 8) - (-2x^2 + 4x + 2)\)

\[
\frac{3x^2+4x-8}{2x^2+4x+2} + \frac{3x^2+4x-8}{5x^2-10}
\]

**Score 2:** The student gave a complete and correct response.
25 Express in simplest form: \((3x^2 + 4x - 8) - (-2x^2 + 4x + 2)\)

\[
\begin{align*}
\underline{3x^2 + 4x - 8} & \\
\underline{+ 2x^2 - 4x - 2} & \\
\hline
x^2 - 10 & 
\end{align*}
\]

**Score 1:** The student did not add \(3x^2\) and \(2x^2\).
Express in simplest form: \((3x^2 + 4x - 8) - (-2x^2 + 4x + 2)\)

\[
(3x^2 + 4x - 8) + (-2x^2 + 4x + 2)
\]

\[x^2 + 8x + 6\]

**Score 0:** The student wrote the problem as addition and combined the constant terms incorrectly.
26 Graph the function \( f(x) = -x^2 - 6x \) on the set of axes below.

\[
\begin{align*}
\frac{-b}{2a} &= \frac{-(-6)}{2(-1)} = \frac{6}{-2} = -3 \\
\text{vertex: } x &= -3
\end{align*}
\]

State the coordinates of the vertex of the graph.

\((-3, 9)\)

**Score 2:** The student gave a complete and correct response.
Graph the function \( f(x) = -x^2 - 6x \) on the set of axes below.

State the coordinates of the vertex of the graph.

\((-3, 9)\)

**Score 1:** The student only graphed \( f(x) \) over the interval \(-6\) to \(0\).
26 Graph the function $f(x) = -x^2 - 6x$ on the set of axes below.

State the coordinates of the vertex of the graph.

$\left(3, -9\right)$

**Score 1:** The student graphed $f(x)$ incorrectly, but stated an appropriate vertex.
Graph the function \( f(x) = -x^2 - 6x \) on the set of axes below.

State the coordinates of the vertex of the graph.

**Score 0:** The student drew an incorrect graph and did not state a vertex.
27 State whether $7 - \sqrt{2}$ is rational or irrational. Explain your answer.

$\text{irrational}$

The difference of a rational and irrational number is always irrational.

It is rational,
but the $\sqrt{2}$ is irrational.
Therefore $7 - \sqrt{2}$ is irrational.

Score 2: The student gave a complete and correct response.
27 State whether \( 7 - \sqrt{2} \) is rational or irrational. Explain your answer.

The difference of a rational number and an irrational number is irrational.

**Score 2:** The student gave a complete and correct response.
27 State whether $7 - \sqrt{2}$ is rational or irrational. Explain your answer.

$$7 - \sqrt{2} = 5.585...$$

$7 - \sqrt{2}$ is irrational because $\sqrt{2}$ is irrational. There is no two same numbers that will multiply to a product of 2, thus making $\sqrt{2}$ radical or a decimal that cannot be converted into a fraction or a terminating decimal. By subtracting radical $2 \quad \sqrt{2}$ from 7 you are decreasing 7 by a radical number, therefore resulting in an irrational answer.

Score 1: The student made an error in describing an irrational number.
27 State whether $7 - \sqrt{2}$ is rational or irrational. Explain your answer.

Irrational, because $2$ is not a perfect square, so $\sqrt{2}$ is irrational.

Score 1: The student only explained why $\sqrt{2}$ is irrational. The student did not address the difference.
27 State whether $7 - \sqrt{2}$ is rational or irrational. Explain your answer.

\[
7 - \sqrt{2} \\
5.585
\]

Irrational. It isn't a whole number.

Score 0: The student did not write the full display of the calculator and wrote an incorrect explanation.
Question 28

28 The value, $v(t)$, of a car depreciates according to the function $v(t) = P(0.85)^t$, where $P$ is the purchase price of the car and $t$ is the time, in years, since the car was purchased. State the percent that the value of the car decreases by each year. Justify your answer.

The car's value decreases by 15% every year. A $10,000 dollar car would be $8,500 dollars the next year because $(10,000)(0.85)^1 = 8,500$. It's the same as multiplying 10,000 by .15 then subtracting your answer from 10,000, because of its annual 15% value decrease.

Score 2: The student gave a complete and correct response.
The value, \( v(t) \), of a car depreciates according to the function \( v(t) = P(0.85)^t \), where \( P \) is the purchase price of the car and \( t \) is the time, in years, since the car was purchased. State the percent that the value of the car decreases by each year. Justify your answer.

\[
\begin{align*}
\text{Percent decrease} &= 100 - 85 \\
&= 15\% \\
\end{align*}
\]

**Score 2:** The student gave a complete and correct response.
28 The value, \( v(t) \), of a car depreciates according to the function \( v(t) = P(0.85)^t \), where \( P \) is the purchase price of the car and \( t \) is the time, in years, since the car was purchased. State the percent that the value of the car decreases by each year. Justify your answer.

\[
1 - 0.85 = 0.15
\]

**Score 1:** The student wrote an appropriate justification, but did not state the percent of decrease.
The value, \( v(t) \), of a car depreciates according to the function \( v(t) = P(0.85)^t \), where \( P \) is the purchase price of the car and \( t \) is the time, in years, since the car was purchased. State the percent that the value of the car decreases by each year. Justify your answer.

\[
\begin{align*}
  v(t) &= 25,000(0.85)^t \\
  P &= 25,000 \\
  t &= 5 \\
  v &= 25,000(0.85)^5 \\
  &= 4,330.62 \\
  \text{By } 4.33 \%, \text{ each year the car will go down}
\end{align*}
\]

**Score 0:** The student wrote a completely incorrect response.
29 A survey of 100 students was taken. It was found that 60 students watched sports, and 34 of these students did not like pop music. Of the students who did not watch sports, 70% liked pop music. Complete the two-way frequency table.

<table>
<thead>
<tr>
<th></th>
<th>Watch Sports</th>
<th>Don’t Watch Sports</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Like Pop</td>
<td>26</td>
<td>28</td>
<td>54</td>
</tr>
<tr>
<td>Don’t Like Pop</td>
<td>34</td>
<td>12</td>
<td>46</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

Score 2: The student gave a complete and correct response.
Question 29

29 A survey of 100 students was taken. It was found that 60 students watched sports, and 34 of these students did not like pop music. Of the students who did not watch sports, 70% liked pop music. Complete the two-way frequency table.

<table>
<thead>
<tr>
<th></th>
<th>Watch Sports</th>
<th>Don’t Watch Sports</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Like Pop</td>
<td>26</td>
<td>25</td>
<td>51</td>
</tr>
<tr>
<td>Don’t Like Pop</td>
<td>34</td>
<td>15</td>
<td>49</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

Score 1: The student made an error when calculating 70% of 40, but then completed the table appropriately.
A survey of 100 students was taken. It was found that 60 students watched sports, and 34 of these students did not like pop music. Of the students who did not watch sports, 70% liked pop music. Complete the two-way frequency table.

<table>
<thead>
<tr>
<th></th>
<th>Watch Sports</th>
<th>Don’t Watch Sports</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Like Pop</td>
<td>18</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>Don’t Like Pop</td>
<td>34</td>
<td>28</td>
<td>62</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

\[60 - 34 = 26\]
\[26 \times 0.7 = 18.2 \approx 18\]
\[\frac{100}{40}\]

\[40 \times 0.7 = 28\]
\[\frac{40}{12}\]

**Score 0:** The student made multiple errors.
30 Graph the inequality $y + 4 < -2(x - 4)$ on the set of axes below.

Score 2: The student gave a complete and correct response.
30 Graph the inequality \( y + 4 < -2(x - 4) \) on the set of axes below.

**Score 1:** The student graphed the dotted line correctly, but did not shade the inequality.
30 Graph the inequality \( y + 4 < -2(x - 4) \) on the set of axes below.

**Score 0:** The student made two graphing errors by drawing a solid line and not shading.
31 If \( f(x) = x^2 \) and \( g(x) = x \), determine the value(s) of \( x \) that satisfy the equation \( f(x) = g(x) \).

\[
\begin{align*}
  x^2 &= x \\
  x^2 - x &= 0 \\
  x(x-1) &= 0 \\
  x = 0 & \quad x = 1
\end{align*}
\]

**Score 2:** The student gave a complete and correct response.
31 If \( f(x) = x^2 \) and \( g(x) = x \), determine the value(s) of \( x \) that satisfy the equation \( f(x) = g(x) \).

\[ y = x^2 \quad y = x \]

The values of \( x \) are 0 and 1.

**Score 2:** The student gave a complete and correct response.
31. If \( f(x) = x^2 \) and \( g(x) = x \), determine the value(s) of \( x \) that satisfy the equation \( f(x) = g(x) \).

\[
\begin{array}{c|c|c|c}
\hline
x & f(x) = x^2 & g(x) = x \\
\hline
-2 & 4 & -2 \\
-1 & 1 & -1 \\
0 & 0 & 0 \\
1 & 1 & 1 \\
\hline
\end{array}
\]

\[X = 0 \quad \text{and} \quad x = 1\]

**Score 2:** The student gave a complete and correct response.
31 If \( f(x) = x^2 \) and \( g(x) = x \), determine the value(s) of \( x \) that satisfy the equation \( f(x) = g(x) \).

\[
\begin{array}{c|c}
0 & 0 \\
1 & 1 \\
2 & 4 \\
3 & 9 \\
\end{array}
\quad
\begin{array}{c|c}
0 & 0 \\
1 & 1 \\
2 & 4 \\
3 & 9 \\
\end{array}
\quad
(0,0) \quad (1,1)
\]

**Score 1:** The student wrote the solutions to \( f(x) = g(x) \) as coordinates.
31 If \( f(x) = x^2 \) and \( g(x) = x \), determine the value(s) of \( x \) that satisfy the equation \( f(x) = g(x) \).

\[ \sqrt{x^2} = x \]

\[ x = 1 \]

**Score 1:** The student found one correct solution.
31 If \( f(x) = x^2 \) and \( g(x) = x \), determine the value(s) of \( x \) that satisfy the equation \( f(x) = g(x) \).

I graphed it & got this as a table.

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y_1 )</th>
<th>( y_2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-5</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>-3</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>-2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-4</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

Score 0: The student showed appropriate work, but did not state either solution.
32 Describe the effect that each transformation below has on the function \( f(x) = |x| \), where \( a > 0 \).

\[ g(x) = |x - a| \]

*it will go to the right by however many \( a \) equals.*

\[ h(x) = |x| - a \]

*will go down based on however many \( a \) equals.*

**Score 2:** The student gave a complete and correct response.
Describe the effect that each transformation below has on the function $f(x) = |x|$, where $a > 0$.

$$g(x) = |x - a|$$

Right $a$

$$h(x) = |x| - a$$

Down $a$

**Score 2:** The student gave a complete and correct response.
32 Describe the effect that each transformation below has on the function \( f(x) = |x| \), where \( a > 0 \).

\[
\begin{align*}
g(x) &= |x - a| \\
\text{moved down} & \ a \ \text{units}
\end{align*}
\]

\[
\begin{align*}
h(x) &= |x| - a \\
\text{moved right} & \ a \ \text{units}
\end{align*}
\]

**Score 1:** The student reversed the horizontal and vertical shifts.
Describe the effect that each transformation below has on the function $f(x) = |x|$, where $a > 0$.

\[ g(x) = |x - a| \]

*The function moves left $a$ units.*

\[ h(x) = |x| - a \]

*The function moves down $a$ units.*

**Score 1:** The student only stated one shift correctly.
Question 32

32 Describe the effect that each transformation below has on the function $f(x) = |x|$, where $a > 0$.

$g(x) = |x - a|$

The function would be translated down $a$ units.

$h(x) = |x| - a$

The function would be translated to the left $a$ units.

Score 0: The student wrote two incorrect responses.
33 The function $r(x)$ is defined by the expression $x^2 + 3x - 18$. Use factoring to determine the zeros of $r(x)$.

$$r(x) = x^2 + 3x - 18 = \frac{18}{1\times18} = \frac{2\times9}{3\times6}$$

$$= (x+6)(x-3) = 0$$

$$x+6 = 0 \quad x-3 = 0$$

$$x = -6 \quad x = 3$$

Explain what the zeros represent on the graph of $r(x)$.

The zeros represent that when the graph crosses the x-axis, "x" is (-6) and (3).

Score 4: The student gave a complete and correct response.
Question 33

33 The function \( r(x) \) is defined by the expression \( x^2 + 3x - 18 \). Use factoring to determine the zeros of \( r(x) \).

\[
\begin{align*}
  r(x) &= x^2 + 3x - 18 \\
  0 &= x^2 + 3x - 18 \\
  0 &= x^2 + 6x - 3x - 18 \\
  0 &= x(x+6) - 3(x+6) \\
  0 &= (x-3)(x+6) \\
  x &= 3 \text{ or } x = -6
\end{align*}
\]

Explain what the zeros represent on the graph of \( r(x) \).

The zeros represent the \( x \)-intercepts.

Score 4: The student gave a complete and correct response.
Question 33

33 The function $r(x)$ is defined by the expression $x^2 + 3x - 18$. Use factoring to determine the zeros of $r(x)$.

$$\begin{align*}
0 &= x^2 + 3x - 18 \\
0 &= (x^2 - 3x) + (6x - 18) \\
0 &= x(x - 3) + 6(x - 3) \\
0 &= (x - 3)(x + 6) \\
&= x - 3 = 0 \quad x + 6 = 0 \\
&= x = 3 \quad x = -6
\end{align*}$$

Explain what the zeros represent on the graph of $r(x)$.

The zeros represent the points at which the parabola crosses the $x$-axis.

Score 3: The student wrote an incomplete explanation by referencing points and not the $x$-values at which the parabola crosses the $x$-axis.
The function \( r(x) \) is defined by the expression \( x^2 + 3x - 18 \). Use factoring to determine the zeros of \( r(x) \).

\[
\begin{align*}
ax^2 + bx + c &= 0 \\
a = 1 & \quad b = 3 \\
c = -18 \\
x^2 + 3x - 18 &= 0 \\
(x + 6)(x - 3) &= 0 \\
x + 6 &= 0 \quad \text{or} \quad x - 3 = 0 \\
x &= -6 \quad \text{or} \quad x = 3
\end{align*}
\]

Explain what the zeros represent on the graph of \( r(x) \).

Points where the parabola crosses the \( x \) axis.

Score 2: The student used a method other than factoring to find the zeros of \( r(x) \) and wrote an incomplete explanation.
The function $r(x)$ is defined by the expression $x^2 + 3x - 18$. Use factoring to determine the zeros of $r(x)$.

3, -6

Explain what the zeros represent on the graph of $r(x)$.

When the line crosses the X-axis

Score 2: The student showed no work to find the zeros and wrote an incomplete explanation.
Question 33

33 The function \( r(x) \) is defined by the expression \( x^2 + 3x - 18 \). Use factoring to determine the zeros of \( r(x) \).

\[
\begin{align*}
\frac{x^2+3x-18}{3x6} &= 0 \\
(x+3)(x+6) &= 0 \\
\end{align*}
\]

\[
\begin{array}{c|c}
x+3 = 0 & x+6 = 0 \\
-3 = 0 & -6 = 0 \\
x = -3 & x = -6 \\
\end{array}
\]

Explain what the zeros represent on the graph of \( r(x) \).

Zeros represent the point of intersection between the equation in the graph.

**Score 1:** The student made a factoring error and wrote an incorrect explanation.
The function \( r(x) \) is defined by the expression \( x^2 + 3x - 18 \). Use factoring to determine the zeros of \( r(x) \).

\[
x^2 + 3x - 18 = 0
\]

\[
x^2 - 3x + 6x - 18
\]

\[
x(x - 3) + 6(x - 3)
\]

\[
(x + 6)(x - 3) = 0
\]

Explain what the zeros represent on the graph of \( r(x) \).

-3

Score 1: The student wrote a correctly factored equation.
Question 33

The function $r(x)$ is defined by the expression $x^2 + 3x - 18$. Use factoring to determine the zeros of $r(x)$.

$r(x) = (0, 3) (0, -6)$

Explain what the zeros represent on the graph of $r(x)$.

Score 0: The student did not show enough work to receive any credit.
The graph below models Craig’s trip to visit his friend in another state. In the course of his travels, he encountered both highway and city driving.

Based on the graph, during which interval did Craig most likely drive in the city? Explain your reasoning.

\[
\begin{align*}
AB: \quad \frac{110}{2} &= 55 \\
BC: \quad 0 \\
CD: \quad \frac{90}{1.5} &= 60 \\
DE: \quad \frac{30}{2} &= 15
\end{align*}
\]

From D to E, 15 miles per hour is an appropriate speed for city driving.

Question 34 is continued on the next page.
Question 34 continued.

Explain what might have happened in the interval between $B$ and $C$.

Craig stopped at a text area on the highway to check his messages.

Determine Craig’s average speed, to the nearest tenth of a mile per hour, for his entire trip.

$$\frac{230}{7} = 32.85714286$$

32.9 miles per hour

Score 4: The student gave a complete and correct response.
34 The graph below models Craig’s trip to visit his friend in another state. In the course of his travels, he encountered both highway and city driving.

Based on the graph, during which interval did Craig most likely drive in the city? Explain your reasoning.

0 to E it is slow but not stopped.

Question 34 is continued on the next page.
Question 34 continued.

Explain what might have happened in the interval between $B$ and $C$.

He took a nap

Determine Craig’s average speed, to the nearest tenth of a mile per hour, for his entire trip.

32.4 mph

Score 4: The student gave a complete and correct response.
34 The graph below models Craig's trip to visit his friend in another state. In the course of his travels, he encountered both highway and city driving.

Based on the graph, during which interval did Craig most likely drive in the city? Explain your reasoning.

D - E because that is the flatter slope without it being completely flat.

Question 34 is continued on the next page.
Question 34 continued.

Explain what might have happened in the interval between $B$ and $C$.

He stopped to eat something.

Determine Craig’s average speed, to the nearest tenth of a mile per hour, for his entire trip.

\[
\frac{110 \text{ m}}{2 \text{ h}} = 55 \text{ mph}
\]

Score 3: The student calculated the average speed incorrectly.
34 The graph below models Craig’s trip to visit his friend in another state. In the course of his travels, he encountered both highway and city driving.

Based on the graph, during which interval did Craig most likely drive in the city? Explain your reasoning.

From hours 5 to 7 (because Craig would be stuck in traffic and the rate of change for hours 5 to 7 is slower than hours 0 to 2 and 3 1/2 to 5.

Question 34 is continued on the next page.
Question 34 continued.

Explain what might have happened in the interval between B and C.

Between interval B and C, Craig could have gotten a flat tire and had to stop.

Determine Craig’s average speed, to the nearest tenth of a mile per hour, for his entire trip.

\[ \text{F.O.C.} = \frac{y-y}{x-x} \]

\[ 0 - a = \frac{110 - 0}{a-0} = \frac{110}{a} = 55 \text{ mph} \]

Score 3: The student made an error in calculating the average speed of the entire trip.
The graph below models Craig’s trip to visit his friend in another state. In the course of his travels, he encountered both highway and city driving.

Based on the graph, during which interval did Craig most likely drive in the city? Explain your reasoning.

Between D and E because there may have been traffic.
Explain what might have happened in the interval between $B$ and $C$.

He may have stopped somewhere to stay there or take a break from driving.

Determine Craig’s average speed, to the nearest tenth of a mile per hour, for his entire trip.

\[
\frac{230 \text{ miles}}{7 \text{ hours}} = 32.8 \text{ miles per hour}
\]

Score 2: The student wrote a correct interval, but with an incomplete explanation, and made a rounding error.
The graph below models Craig’s trip to visit his friend in another state. In the course of his travels, he encountered both highway and city driving.

Based on the graph, during which interval did Craig most likely drive in the city? Explain your reasoning.

\[ \text{B to C because the car was stopped for the whole interval.} \]

Question 34 is continued on the next page.
Question 34 continued.

Explain what might have happened in the interval between B and C.

Determine Craig's average speed, to the nearest tenth of a mile per hour, for his entire trip.

\[
\frac{230}{7} = 32.9
\]

Score 1: The student calculated the average speed correctly.
The graph below models Craig’s trip to visit his friend in another state. In the course of his travels, he encountered both highway and city driving.

Based on the graph, during which interval did Craig most likely drive in the city? Explain your reasoning.

A to B because he was driving up a really steep hill.

Question 34 is continued on the next page.
Question 34 continued.

Explain what might have happened in the interval between \( B \) and \( C \).

he was driving really slow

Determine Craig’s average speed, to the nearest tenth of a mile per hour, for his entire trip.

\[
\text{total miles} \quad \frac{230}{5.5} = 41.8
\]

Score 0:  The student wrote a completely incorrect response.
35 Given:

\[ g(x) = 2x^2 + 3x + 10 \]
\[ k(x) = 2x + 16 \]

Solve the equation \( g(x) = 2k(x) \) algebraically for \( x \), to the nearest tenth.

\[
\begin{align*}
2x^2 + 3x + 10 &= 4x + 32 \\
-4x - 32 &= -4x - 32 \\
2x^2 - 1x - 22 &= 0
\end{align*}
\]

\[
\frac{1 \pm \sqrt{1 + 4 \cdot 4 \cdot 22}}{4}
\]

\[
\begin{align*}
x &= \frac{1 + \sqrt{1 + 4 \cdot 4 \cdot 22}}{4} \\
&= \frac{1 + \sqrt{1 + 352}}{4} \\
&= \frac{1 + \sqrt{353}}{4} \\
&= \frac{1 + 18.78}{4} \\
&= \frac{19.78}{4} \\
&= 4.945 \quad (\text{approx})
\end{align*}
\]

\[
\begin{align*}
x &= x \\
&= 3.6, -3.1
\end{align*}
\]

Explain why you chose the method used to solve this quadratic equation.

I used this method (the quadratic formula) since the equation \( 2x^2 - 1x - 22 = 0 \) could not be factored by grouping.

Score 4: The student gave a complete and correct response.
35 Given:

\[ g(x) = 2x^2 + 3x + 10 \]
\[ k(x) = 2x + 16 \]

Solve the equation \( g(x) = 2k(x) \) algebraically for \( x \), to the nearest tenth.

\[
\begin{align*}
2x^2 + 3x + 10 &= 2(2x + 16) \\
2x^2 + 3x + 10 &= 4x + 32 \\
2x^2 - x - 22 &= 0 \\
(2x + 3)(x - 2) &= 0 \\
2x + 3 &= 0 & x - 2 &= 0
\end{align*}
\]

\[ x = -\frac{3}{2} \quad x = 2 \]

Explain why you chose the method used to solve this quadratic equation.

I chose this method because it factors easily.

Score 3: The student did not distribute 2 to both 2x and 16.
Question 35

35 Given:

\[ g(x) = 2x^2 + 3x + 10 \]
\[ k(x) = 2x + 16 \]

Solve the equation \( g(x) = 2k(x) \) algebraically for \( x \), to the nearest tenth.

\[
\begin{align*}
2x^2 + 3x + 10 &= 2(2x + 16) \\
2x^2 + 3x + 10 &= 4x + 32 \\
2x^2 - 4x + 22 &= 0 \\
2(x^2 - 2x + 11) &= 0 \\
x &= \frac{2 \pm \sqrt{(-4)^2 - 4(1)(11)}}{4} \\
x &= \frac{2 \pm \sqrt{4 - 44}}{4} \\
x &= \frac{2 \pm \sqrt{-40}}{4} \\
x &= \frac{2 \pm 2\sqrt{10}}{4} \\
x &= \pm \sqrt{10} \\
x &= \pm \sqrt{10} \\
\end{align*}
\]

Explain why you chose the method used to solve this quadratic equation.

I used the quadratic formula because completing the square did not work because factors of -44 do not add up to -10.

Score 2: The student made a correct substitution into the quadratic formula and wrote a correct explanation.
35 Given:

\[ g(x) = 2x^2 + 3x + 10 \]
\[ k(x) = 2x + 16 \]

Solve the equation \( g(x) = 2k(x) \) algebraically for \( x \), to the nearest tenth.

\[
\begin{align*}
2x^2+3x+10 &= 2(2x+16) \\
2x^2+3x+10 &= 4x+32 \\
2x^2+3x+10 - 4x-32 &= 0 \\
2x^2 - x - 22 &= 0 \\
\alpha &= 2, \beta = -1, \gamma = -11 \\
\Delta &= (-1)^2 - 4 \cdot 2 \cdot (-11) \\
\Delta &= 1 + 176 \\
\Delta &= 177 \\
\end{align*}
\]

\[ x = \frac{1 \pm \sqrt{177}}{4} \]

\[ x_1 = \frac{1 + 177}{4} = 3.57 \]

\[ x_2 = \frac{1 - 177}{4} = -3.07 \]

Explain why you chose the method used to solve this quadratic equation.

---

**Score 2:** The student made a rounding error and did not write an explanation.
Question 35

35 Given:

\[ g(x) = 2x^2 + 3x + 10 \]
\[ k(x) = 2x + 16 \]

Solve the equation \( g(x) = 2k(x) \) algebraically for \( x \), to the nearest tenth.

\[
\begin{align*}
2x^2 + 3x + 10 &= 2(2x + 16) \\
2x^2 + 3x + 10 &= 4x + 32 \\
-7x &= 22 \\
2x^2 - 11x - 22 &= 0 \\

x &= -3 \quad x = 3.6
\end{align*}
\]

Explain why you chose the method used to solve this quadratic equation.

I chose to find \( x \) by putting the quadratic equation in the calculator since doing it manually got me nowhere.

Score 1: The student wrote an appropriate explanation, but a method other than algebraic was used, and only one correct solution was stated.
Given:

\[ g(x) = 2x^2 + 3x + 10 \]
\[ k(x) = 2x + 16 \]

Solve the equation \( g(x) = 2k(x) \) algebraically for \( x \), to the nearest tenth.

\[
\begin{align*}
g(x) &= 2k(x) \\
2x^2 + 3x + 10 &= 4x + 32 \\
2x^2 + 3x - 22 &= 0 \\
x &= \frac{-3 \pm \sqrt{3^2 - 4(2)(-22)}}{2(2)} \\
&= \frac{-3 \pm \sqrt{9 + 176}}{4} \\
&= \frac{-3 \pm \sqrt{185}}{4} \\
&= \frac{-3 \pm 13.6}{4} \\
x &\approx 3.1
\end{align*}
\]

Explain why you chose the method used to solve this quadratic equation.

I used substitution to solve because the question gave me the equations to work with so I substituted \( g(x) \) and \( k(x) \) into \( g(x) = 2k(x) \).

Score 0: The student did not show enough work to receive any credit.
Michael has $10 in his savings account. Option 1 will add $100 to his account each week. Option 2 will double the amount in his account at the end of each week.

Write a function in terms of \( x \) to model each option of saving.

\[
\begin{align*}
\text{Option 1} & \quad f(x) = 10 + 100x \\
\text{Option 2} & \quad g(x) = 10(2)^x
\end{align*}
\]

Michael wants to have at least $700 in his account at the end of 7 weeks to buy a mountain bike. Determine which option(s) will enable him to reach his goal. Justify your answer.

\[
\begin{align*}
\text{Option 1: } & \quad f(7) = 10 + 100 \cdot 7 \\
& \quad = 10 + 700 \\
& \quad = 710 \\
\text{Option 2: } & \quad g(7) = 10 \cdot 2^7 \\
& \quad = 10 \cdot 128 \\
& \quad = 1280
\end{align*}
\]

He will reach his goal with either option.

**Score 4:** The student gave a complete and correct response.
36 Michael has $10 in his savings account. Option 1 will add $100 to his account each week. Option 2 will double the amount in his account at the end of each week.

Write a function in terms of $x$ to model each option of saving.

$\text{Option 1: } f(x) = 100x + 10$

$\text{Option 2: } f(x) = 10(2)^x$

Michael wants to have at least $700 in his account at the end of 7 weeks to buy a mountain bike. Determine which option(s) will enable him to reach his goal. Justify your answer.

Both, Option 1 will supply $710 to Michael but Option 2 will supply $1280 so both will give him enough money to buy the bike.

Score 4: The student gave a complete and correct response.
Michael has $10 in his savings account. Option 1 will add $100 to his account each week. Option 2 will double the amount in his account at the end of each week.

Write a function in terms of $x$ to model each option of saving.

\[ f(x) = 100x + 10 \]
\[ f(x) = 10(1.02)^x \]

Michael wants to have at least $700 in his account at the end of 7 weeks to buy a mountain bike. Determine which option(s) will enable him to reach his goal. Justify your answer.

\[ y = 100(7) + 10 \]
\[ y = 710 \]
\[ y = 10(1.02)^7 \]
\[ y = 11.5 \]

**Score 3:** The student wrote an incorrect function for option 2, but gave an appropriate determination and justification.
Question 36

36 Michael has $10 in his savings account. Option 1 will add $100 to his account each week. Option 2 will double the amount in his account at the end of each week.

Write a function in terms of $x$ to model each option of saving.

\[
\begin{align*}
#1 & \quad 100x + 10 \geq 700 \\
#2 & \quad 10(2)^x \geq 700
\end{align*}
\]

Michael wants to have at least $700 in his account at the end of 7 weeks to buy a mountain bike. Determine which option(s) will enable him to reach his goal. Justify your answer.

\[
\begin{align*}
7 \text{ Weeks} \\
100(7) + 10 & \geq 700 \quad \checkmark \\
710 & \geq 700 \\
10(2)^7 & \geq 700 \quad \checkmark \\
1280 & \geq 700
\end{align*}
\]

Score 3: The student did not write two correct functions, but wrote two appropriate inequalities that they used to justify their answer.
Michael has $10 in his savings account. Option 1 will add $100 to his account each week. Option 2 will double the amount in his account at the end of each week.

Write a function in terms of $x$ to model each option of saving.

**Option 1:** $f(x) = 100x + 10$

**Option 2:** $f(x) = 10(2^x)$

Michael wants to have at least $700 in his account at the end of 7 weeks to buy a mountain bike. Determine which option(s) will enable him to reach his goal. Justify your answer.

Both options will enable Michael to reach his goal, because after 7 weeks with Option 1 Michael will have $710, and $1280 after Option 2.

**Score 2:** The student made a correct determination, but did not write either function using proper notation.
36 Michael has $10 in his savings account. Option 1 will add $100 to his account each week. Option 2 will double the amount in his account at the end of each week.

Write a function in terms of $x$ to model each option of saving.

\[
\text{Option 1: } M = 10 + 100x
\]
\[
\text{Option 2: } M = 10 \cdot 2^x
\]

Michael wants to have at least $700 in his account at the end of 7 weeks to buy a mountain bike. Determine which option(s) will enable him to reach his goal. Justify your answer.

both will get michael $700 after 7 weeks but option 2 will give him lots more than $700

Score 1: The student stated both options will work.
36. Michael has $10 in his savings account. Option 1 will add $100 to his account each week. Option 2 will double the amount in his account at the end of each week.

Write a function in terms of \( x \) to model each option of saving.

\[
100x + 10 \\
10x^2
\]

Michael wants to have at least $700 in his account at the end of 7 weeks to buy a mountain bike. Determine which option(s) will enable him to reach his goal. Justify your answer.

\[
100(7) + 10 \geq 700 \\
700 \geq 700
\]

\[
10(7)^2 \geq 700 \\
490 \geq 700
\]

**Score 0:** The student wrote only one appropriate expression.
Central High School had five members on their swim team in 2010. Over the next several years, the team increased by an average of 10 members per year. The same school had 35 members in their chorus in 2010. The chorus saw an increase of 5 members per year.

Write a system of equations to model this situation, where \( x \) represents the number of years since 2010.

\[
\begin{align*}
Y &= 10x + 5 \\
Y &= 5x + 35
\end{align*}
\]
Question 37 continued.

Graph this system of equations on the set of axes below.

![Graph](image)

Explain in detail what each coordinate of the point of intersection of these equations means in the context of this problem.

The coordinate (6, 65) displays that 6 years after 2010, both the swim team and the chorus had 65 members, and in the next year, the number of people on the swim team will surpass the chorus.

Score 6:  The student gave a complete and correct response.
37 Central High School had five members on their swim team in 2010. Over the next several years, the team increased by an average of 10 members per year. The same school had 35 members in their chorus in 2010. The chorus saw an increase of 5 members per year.

Write a system of equations to model this situation, where \( x \) represents the number of years since 2010.

\[
\begin{align*}
S : & \quad 5 + 10x = y \\
C : & \quad 35 + 5x = y
\end{align*}
\]
Graph this system of equations on the set of axes below.

Explain in detail what each coordinate of the point of intersection of these equations means in the context of this problem.

The intersection point means both clubs had the same number of students at the same time.

Score 5: The student wrote an incomplete explanation.
Central High School had five members on their swim team in 2010. Over the next several years, the team increased by an average of 10 members per year. The same school had 35 members in their chorus in 2010. The chorus saw an increase of 5 members per year.

Write a system of equations to model this situation, where $x$ represents the number of years since 2010.

\begin{align*}
  y &= 5x + 35 \\
  y &= 10x + 5
\end{align*}
Question 37 continued.

Graph this system of equations on the set of axes below.

Explain in detail what each coordinate of the point of intersection of these equations means in the context of this problem.

Score 4: The student wrote a correct system of equations. Both lines are graphed correctly, but neither one is labeled. An incomplete explanation was written.
Central High School had five members on their swim team in 2010. Over the next several years, the team increased by an average of 10 members per year. The same school had 35 members in their chorus in 2010. The chorus saw an increase of 5 members per year.

Write a system of equations to model this situation, where $x$ represents the number of years since 2010.

Swim: $y = 10x + 5$
Chorus: $y = 6x + 35$

Question 37 is continued on the next page.
Question 37 continued.

Graph this system of equations on the set of axes below.

Explain in detail what each coordinate of the point of intersection of these equations means in the context of this problem.

\[ x \text{ is the number of years after 2010 in which the number of students in each activity is the same.} \]

Score 4: The student wrote a correct system of equations and explained both coordinates in the context of the problem.
Central High School had five members on their swim team in 2010. Over the next several years, the team increased by an average of 10 members per year. The same school had 35 members in their chorus in 2010. The chorus saw an increase of 5 members per year.

Write a system of equations to model this situation, where \( x \) represents the number of years since 2010.

\[
g = 5 + 10x \\
\gamma = 35 + 5x
\]
Graph this system of equations on the set of axes below.

Explain in detail what each coordinate of the point of intersection of these equations means in the context of this problem.

The point of intersection means that this year both teams have the same number of players on the team.

Score 3: The student wrote a correct system of equations, but did not graph them correctly. An incomplete explanation was written.
37 Central High School had five members on their swim team in 2010. Over the next several years, the team increased by an average of 10 members per year. The same school had 35 members in their chorus in 2010. The chorus saw an increase of 5 members per year.

Write a system of equations to model this situation, where \( x \) represents the number of years since 2010.

\[
\begin{align*}
\text{Swim Team:} & \quad 5 + 10x \\
\text{Chorus:} & \quad 35 + 5x
\end{align*}
\]
Graph this system of equations on the set of axes below.

Explain in detail what each coordinate of the point of intersection of these equations means in the context of this problem.

this means that in 3 years they will both have 115 members; then after the swim team will have more

Score 2: The student wrote an appropriate explanation based on their graph.
37 Central High School had five members on their swim team in 2010. Over the next several years, the team increased by an average of 10 members per year. The same school had 35 members in their chorus in 2010. The chorus saw an increase of 5 members per year.

Write a system of equations to model this situation, where \( x \) represents the number of years since 2010.

\[
\text{let } x = \text{number of years} \\
\text{Swim (2010)} = 5 + (10x) \\
\text{2010 - Chorus} = 35 + 5x
\]
Question 37 continued.

Graph this system of equations on the set of axes below.

Explain in detail what each coordinate of the point of intersection of these equations means in the context of this problem.

Each coordinate represents a change in the number of students after X years.

Score 1: The student wrote two appropriate expressions.
Central High School had five members on their swim team in 2010. Over the next several years, the team increased by an average of 10 members per year. The same school had 35 members in their chorus in 2010. The chorus saw an increase of 5 members per year.

Write a system of equations to model this situation, where \( x \) represents the number of years since 2010.

\[
35 + 5(x) > 35 \\
5 + 10(x) > 5
\]

Question 37 is continued on the next page.
Question 37 continued.

Graph this system of equations on the set of axes below.

Explain in detail what each coordinate of the point of intersection of these equations means in the context of this problem.

Score 0: The student did not show enough correct work to receive any credit.