Question 1 of 27

A car rental company’s standard charge includes an initial fee plus an additional fee for each mile driven. The standard charge $S$ (in dollars) is given by the function $S = 0.50M + 15.75$, where $M$ is the number of miles driven.

The company also offers an option to insure the car against damage. The insurance charge $I$ (in dollars) is given by the function $I = 0.15M + 4.90$.

Let $C$ be the total charge (in dollars) for a rental that includes insurance. Write an equation relating $C$ to $M$. Simplify your answer as much as possible.

Question 2 of 27

Suppose that the functions $f$ and $g$ are defined for all real numbers $x$ as follows.

\[ f(x) = x + 1 \]
\[ g(x) = 4x^2 \]

Write the expressions for $(f + g)(x)$ and $(f g)(x)$ and evaluate $(f - g)(2)$.
\[ (f + g)(x) \]
\[ (f g)(x) \]
\[ (f - g)(2) \]
Question 3 of 27

Suppose that the functions $h$ and $g$ are defined as follows.

$$ h(x) = (-5 + x)(2 + x) $$
$$ g(x) = -9 - 6x $$

(a) Find $\left( \frac{h}{g} \right)(-3)$.

(b) Find all values that are NOT in the domain of $\frac{h}{g}$.
If there is more than one value, separate them with commas.

Question 4 of 27

Suppose that the functions $f$ and $g$ are defined as follows.

$$ f(x) = \frac{x - 3}{x + 8} $$
$$ g(x) = \frac{x}{x + 8} $$

Find $\frac{f}{g}$. Then, give its domain using an interval or union of intervals.
Simplify your answers.
Question 5 of 27

Suppose that the functions \( f \) and \( g \) are defined as follows.

\[
f(x) = \frac{1}{2x^2 + 1}
\]
\[
g(x) = \sqrt{5x + 3}
\]

Find \( f \cdot g \) and \( f + g \). Then, give their domains using interval notation.

\[
(f \cdot g)(x) = \quad \square \\
\text{Domain of } f \cdot g: \quad \square \\
\]

\[
(f + g)(x) = \quad \square \\
\text{Domain of } f + g: \quad \square \\
\]

Question 6 of 27

Suppose that the functions \( u \) and \( w \) are defined as follows.

\[
u(x) = 2x \\
w(x) = x^2 - 2
\]

Find the following.

\[
(u \circ w)(-1) \\
(w \circ u)(-1)
\]
Question 7 of 27

Suppose that the functions \( g \) and \( h \) are defined as follows.

\[
g(x) = x^2 + 6 \\
h(x) = \frac{7}{5x}, \quad x \neq 0
\]

Find the compositions \( g \circ g \) and \( h \circ h \).

Simplify your answers as much as possible.

(Assume that your expressions are defined for all \( x \) in the domain of the composition. You do not have to indicate the domain.)

\[
(g \circ g)(x) = \\
(h \circ h)(x) =
\]

Question 8 of 27

For the real-valued functions \( f(x) = \sqrt{5x + 35} \) and \( g(x) = x - 4 \), find the composition \( f \circ g \) and specify its domain using interval notation.

\[
(f \circ g)(x) = \\
\text{Domain of } f \circ g:
\]

Question 9 of 27

Suppose the value \( R(d) \) of \( d \) dollars in euros is given by \( R(d) = \frac{8}{9}d \).

The cost \( P(n) \) in dollars to purchase and ship \( n \) purses is given by \( P(n) = 88n + 23 \).

Write a formula for the cost \( Q(n) \) in euros to purchase and ship \( n \) purses.

It is not necessary to simplify.

\[
Q(n) =
\]
Question 10 of 27
Suppose that \( y \) varies directly with \( x \), and \( y = 20 \) when \( x = 8 \).

(a) Write a direct variation equation that relates \( x \) and \( y \).

Equation:

(b) Find \( y \) when \( x = 3 \).

\[ y = \]

Question 11 of 27
For a moving object, the force acting on the object varies directly with the object's acceleration. When a force of 15 N acts on a certain object, the acceleration of the object is 5 m/s\(^2\). If the acceleration of the object becomes 6 m/s\(^2\), what is the force?
Question 12 of 27

Isabel is riding her bike. The distance she travels varies directly with the number of revolutions (turns) her wheels make. See the graph below.

(a) How many revolutions does Isabel make per foot of distance traveled?

revolution(s)

(b) What is the slope of the graph?

Question 13 of 27

Suppose that \( y \) varies inversely with \( x \), and \( y = 3 \) when \( x = 10 \).

(a) Write an inverse variation equation that relates \( x \) and \( y \).

Equation:

(b) Find \( y \) when \( x = 12 \).

\[ y = \]
Question 14 of 27
When a constant force is applied to an object, the acceleration of the object varies inversely with its mass. When a certain constant force acts upon an object with mass 4 kg, the acceleration of the object is $7 \text{ m/s}^2$. When the same force acts upon another object, its acceleration is $2 \text{ m/s}^2$. What is the mass of this object?

Question 15 of 27
Write an equation that expresses the following relationship.

$$d \text{ varies jointly with } w \text{ and } p \text{ and inversely with } u$$

In your equation, use $k$ as the constant of proportionality.

Question 16 of 27
Suppose that the amount of time it takes to build a highway varies directly with the length of the highway and inversely with the number of workers. Suppose also that it takes 150 workers 14 weeks to build 12 miles of highway. How many miles of highway could 125 workers build in 21 weeks?

\[
\text{miles}
\]
Question 17 of 27

The graph of a quadratic function with vertex \((3, 2)\) is shown in the figure below. Find the domain and the range.

Write the domain and range using interval notation.

\[
\begin{align*}
\text{domain} &= \quad \\
\text{range} &= \quad 
\end{align*}
\]
Use the graph of the parabola to fill in the table.

(a) Does the parabola open upward or downward?

- upward  o downward

(b) Find the equation of the axis of symmetry.

equation of axis of symmetry: __________

(c) Find the coordinates of the vertex.

vertex: (____, ____)

(d) Find the intercept(s).

For both the $x$- and $y$-intercept(s), make sure to do the following.

- If there is more than one, separate them with commas.
- If there are none, select "None".

$x$-intercept(s): __________

$y$-intercept(s): __________
Question 19 of 27
Graph the parabola.

\[ y = x^2 - 6x + 10 \]

Question 20 of 27
Graph the parabola.

\[ y = 2(x - 5)^2 - 3 \]
Graph the parabola.

\[ y = -3x^2 + 24x - 44 \]

Question 22 of 27

Find the \( x \)-intercept(s) and the coordinates of the vertex for the parabola \( y = x^2 - 2x - 8 \). If there is more than one \( x \)-intercept, separate them with commas.

Question 23 of 27

Answer the questions below about the quadratic function.

\[ f(x) = -2x^2 - 20x - 48 \]

<table>
<thead>
<tr>
<th>Does the function have a minimum or maximum value?</th>
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<tbody>
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<tr>
<td>Where does the minimum or maximum value occur?</td>
</tr>
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</tbody>
</table>
Question 24 of 27
A medical equipment industry manufactures X-ray machines. The unit cost $C$ (the cost in dollars to make each X-ray machine) depends on the number of machines made. If $x$ machines are made, then the unit cost is given by the function $C(x) = 0.4x^2 - 200x + 35,876$. What is the minimum unit cost?
Do not round your answer.

Question 25 of 27
Ashley has 280 meters of fencing and wishes to form three sides of a rectangular field. The fourth side borders a river and will not need fencing.

As shown below, one of the sides has length $x$ (in meters).

As shown below, one of the sides has length $x$ (in meters).

(a) Find a function that gives the area $A(x)$ of the field (in square meters) in terms of $x$.

$A(x) =$

(b) What side length $x$ gives the maximum area that the field can have?

Side length $x$: meters

(c) What is the maximum area that the field can have?

Maximum area: square meters
Question 26 of 27

The graph of a quadratic function with vertex \((-2, -4)\) is shown in the figure below. Find the domain and the range.

Write the domain and range using interval notation.

\[
domain = \underline{\hspace{2cm}} \\
range = \underline{\hspace{2cm}} \\
\]

Question 27 of 27

Find the equation of the quadratic function \(f\) whose graph is shown below.
Question 1 of 27

\[ C = 0.65M + 20.65 \]

Question 2 of 27

\[
(f + g)(x) = 4x^2 + x + 1 \\
(fg)(x) = 4x^3 + 4x^2 \\
(f - g)(2) = -13
\]

Question 3 of 27

(a) \( \left( \frac{h}{g} \right)(-3) = \frac{8}{9} \)

(b) Value(s) that are NOT in the domain of \( \frac{h}{g} \): \( -\frac{3}{2} \)

Question 4 of 27

\[
\left( \frac{f}{g} \right)(x) = \frac{x - 3}{x}
\]

Domain of \( \frac{f}{g} \): \( (-\infty, -8) \cup (-8, 0) \cup (0, \infty) \)

Question 5 of 27
\((fg)(x) = \frac{\sqrt{5x + 3}}{2x^2 + 1}\)

Domain of \(fg\): \([-\frac{3}{5}, \infty)\)

\((f + g)(x) = \frac{1}{2x^2 + 1} + \sqrt{5x + 3}\)

Domain of \(f + g\): \([-\frac{3}{5}, \infty)\)

**Question 6 of 27**

\((u \circ w)(-1) = -2\)
\((w \circ u)(-1) = 2\)

**Question 7 of 27**

\((g \circ g)(x) = x^4 + 12x^2 + 42\)
\((h \circ h)(x) = x\)

**Question 8 of 27**

\((f \circ g)(x) = \sqrt{5x + 15}\)

Domain of \(f \circ g\): \([-3, \infty)\)

**Question 9 of 27**

\(Q(n) = \frac{8}{9}(88n + 23)\)

**Question 10 of 27**
(a) Write a direct variation equation that relates \( x \) and \( y \).

Equation: \( y = \frac{5}{2}x \)

(b) Find \( y \) when \( x = 3 \).

\[ y = \frac{15}{2} \]

Question 11 of 27

18 N

Question 12 of 27

(a) How many revolutions does Isabel make per foot of distance traveled?

\[ \frac{1}{4} \text{ revolution(s)} \]

(b) What is the slope of the graph?

4

Question 13 of 27

(a) Write an inverse variation equation that relates \( x \) and \( y \).

Equation: \( y = \frac{30}{x} \)

(b) Find \( y \) when \( x = 12 \).

\[ y = \frac{5}{2} \]

Question 14 of 27

14 kg

Question 15 of 27
\[ d = \frac{kw}{u} \]

**Question 16 of 27**

The answer is 15 miles.

**Question 17 of 27**

domain: \((-\infty, \infty)\)

range: \([2, \infty)\)

**Question 18 of 27**
(a) Does the parabola open upward or downward?

- upward
- downward

(b) Find the equation of the axis of symmetry.

equation of axis of symmetry: \( x = -3 \)

(c) Find the coordinates of the vertex.

vertex: \((-3, 1)\)

(d) Find the intercept(s).

For both the \(x\)- and \(y\)-intercept(s), make sure to do the following.

- If there is more than one, separate them with commas.
- If there are none, select "None".

\[\begin{align*}
\text{\(x\)-intercept(s):} & \quad -4, -2 \\
\text{\(y\)-intercept(s):} & \quad -8
\end{align*}\]
Question 20 of 27

Question 21 of 27

Question 22 of 27

$x$-intercept(s): $-2, 4$

vertex: $(1, -9)$

Question 23 of 27
<table>
<thead>
<tr>
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<tr>
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<tr>
<td>☐ Maximum</td>
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<tr>
<th>What is the function's minimum or maximum value?</th>
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</table>

<table>
<thead>
<tr>
<th>Where does the minimum or maximum value occur?</th>
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<tbody>
<tr>
<td>( x = -5 )</td>
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</table>
Question 24 of 27

Unit cost: $10,876

Question 25 of 27

(a) Find a function that gives the area \( A(x) \) of the field (in square meters) in terms of \( x \).

\[
A(x) = 280x - 2x^2
\]

(b) What side length \( x \) gives the maximum area that the field can have?

Side length \( x \): 70 meters

(c) What is the maximum area that the field can have?

Maximum area: 9,800 square meters

Question 26 of 27

domain: \( (-\infty, \infty) \)

range: \( (-\infty, -4] \)

Question 27 of 27

\( f(x) = -3(x + 1)^2 + 6 \)