Solve
\[ x = 2x 
\]
\[ x = 2x - 6 - (-x) \]
\[ x = 3x - 6 \]
\[ x - 3x = 3x - 6 - 3x \]
\[ -2x = -6 \]
\[ \frac{-2x}{-2} = \frac{-6}{-2} \]
\[ x = 3 \]

Solve
\[ \frac{3}{4} (4x - 3) = 2 \left[ x \circ (4x - 3) \right] \]
\[ \frac{3}{4} (4x - 3) = 2 [ \frac{x}{4} - 4x + 3 ] \]
\[ \frac{6x - 9}{4} = -6x + 6 \]
\[ 6x - \frac{9}{2} + 6x = -6x + 6 + 6x \]
\[ 12x - \frac{9}{2} = 6 \]
\[ 12x - \frac{9}{2} + \frac{9}{2} = 6 + \frac{9}{2} \]
\[ 12x = \frac{21}{2} \]
\[ x = \frac{21}{24} or \boxed{x = \frac{7}{8}} \]

Solve
\[ 6y = -\frac{3}{5} \]
\[ 7(\frac{3}{5}) = 7(-\frac{3}{5}) \]
\[ 6y = -\frac{21}{5} \]
\[ y = \frac{-21}{5} \times \frac{1}{6} \]
\[ y = \frac{-21}{30} \]
\[ y = -\frac{7}{10} \] or \( y = \boxed{-\frac{7}{10}} \)
Solve \[ 1.4(.2x + 1.3) = 0.5(1x + 4.56) \]
\[ .28x + 1.82 = .05x + 2.28 \]
\[ .23x + 1.82 = 2.28 \]
\[ .23x = .46 \]
\[ x = 2 \]

Solve \[ S = P(1 + rt) \] for \( t \).

\[ S = P + Prt \]
\[ S - P = Prt \]
\[ \frac{S - P}{Pr} = t \]

Solve \[ a(x^2 - 9x + 4) = 0 \]
\[ (2x - 1)(x - 4) = 0 \]
\[ 2x - 1 = 0 \text{ or } x - 4 = 0 \]
\[ 2x = 1 \]
\[ x = \frac{1}{2} \]

Either \( x = \frac{1}{2} \) or \( x = 4 \)

Solve \[ (10 - a)x(5-x) = 50 \]

\[ 10(5) + 10(-x) + (-2x)(5) + (-2x)(-x) = 50 \]
\[ 50 - 10x - 10x + 2x^2 = 50 \]
\[ 2x^2 - 20x + 50 = 0 \]
\[ x(-20 + 2x) = 0 \]
\[ x = 0 \text{ or } -20 + 2x = 0 \]

Either \( x = 0 \) or \( x = 10 \)

\[ x = 10 \]
Suppose the weekly revenue, \( r \), for a company is given by:
\[
r = -2p^2 + 400p
\]
where \( p \) is the price. What is the price if the revenue is $18,750?

\[
18750 = -2p^2 + 400p
\]

Use quadratic formula:
\[
p = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\]
Here \( a = 2 \)
\( b = -400 \)
\( c = 18750 \)

\[
p = \frac{-(-400) \pm \sqrt{(-400)^2 - 4(2)(18750)}}{2(2)}
\]

\[
p = \frac{400 \pm \sqrt{160000 - 150000}}{4}
\]

\[
p = \frac{400 \pm \sqrt{10000}}{4}
\]

\[
p = \frac{400 \pm 100}{4}
\]

\[
p = \frac{400 + 100}{4} \text{ or } \frac{400 - 100}{4}
\]

\[
p = \frac{500}{4} \text{ or } \frac{300}{4}
\]

\[
p = 125 \text{ or } 75.
\]

The price is either $125 or $75.
Solve \(3(4x - 1) \geq 2(x + 4)\)
\[12x - 3 \geq 2x + 8\]
\[10x \geq 11\]
\[x \geq \frac{11}{10}\]

Solve \(\frac{t - 1}{4} + 3 > \frac{t}{3}\)
\[4\left(\frac{t - 1}{4} + 3\right) > 4\left(\frac{t}{3}\right)\]
\[t - 1 + 12 > \frac{4t}{3}\]
\[3(t + 11) > 3\left(\frac{4t}{3}\right)\]
\[3t + 33 > 4t\]
\[-t + 33 > 0\]
\[-t > -33\]
\[t < 33\]

\[\text{MUST change the sign if you multiply or divide by a negative!}\]

Solve \(3(3 - 2x) \geq 4(1 - 3x)\)
\[9 - 6x \geq 4 - 12x\]
\[9 + 6x \geq 4\]
\[6x \geq 3.1\]
\[x \geq \frac{3.1}{6}\]
\[x \geq 0.5167\]
A manufacturer has 4000 units and is selling it at $10 per unit. Next month, the price will increase by $2 per unit. The manufacturer wants the total revenue from the sale of all 4000 units to be no less than $45,000. What is the maximum number of units that can be sold this month?

Let \( y \) be the number of units sold this month.

\[ \text{We will have } 4000 - y \text{ to sell next month.} \]

\[
\text{Total Revenue} = \text{Revenue for this month} + \text{Revenue from next month}
\]

\[ 45000 = \frac{y}{10} \cdot 10 + (4000 - y)(12) \cdot 12 \]

\[ 45000 = 10y + 48000 - 12y \]

\[ 45000 = 10y + 48000 - 12y \]

\[ -3000 = -2y \]

\[ y = \frac{-3000}{-2} = 1500 \]

\[
\boxed{\text{We may sell a maximum of 1500 units this month.}}
\]
A pet food company needs to calculate how much to charge for a bag of rabbit food that costs $10 to produce. The fixed costs are $15,000. They want to make a profit after selling 4000 bags. What should they charge?

Let \( p \) be the price per bag.

\[
\begin{align*}
\text{Know:} & \quad \text{Profit} = 0 \text{ after selling 4000 bags.} \\
& \quad \text{Profit} = \text{Revenue} - \text{Cost} \\
& \quad \text{Revenue} = \text{quantity} \times \text{price} \\
& \quad \text{Cost} = \text{fixed cost} + \text{quantity} \times \text{cost/} \text{per unit}. \\
\end{align*}
\]

\[
\begin{align*}
0 &= 4000p - (15000 + 4000 \times 10) \\
0 &= 4000p - (15000 + 40000) \\
0 &= 4000p - 55000 \\
-4000p &= -55000 \\
p &= \frac{-55000}{-4000} \\
p &= \$13.75
\end{align*}
\]
Car rental company A rents cars for $32 per day. Company B rents for $31 per day, plus an initial fee of $55. If a customer wants a cheaper rate, when should he rent from company B?

Let \( t \) be the number of days the car is rented.

Cost for A: \( \text{Cost} = 32t \)
Cost for B: \( \text{Cost} = 55 + 21t \)

\[
55 + 21t \leq 32t \\
55 \leq 11t \\
5 \leq t
\]

We should use B if we rent for 5 or more days.
If \( g(x) = \frac{x}{x-4} \), find:

a) the domain.

The denominator can’t be 0.
\[ x-4 \neq 0 \]
\[ x \neq 4 \]

The domain is all values of \( x \) except \( x=4 \).

b) \( g(0) = \frac{0}{0-4} = \frac{0}{-4} = 0 \)  \[ \text{If 0 is the numerator and the denominator is 0, the answer is undefined.} \]

c) \( g(-4) = \frac{-4}{-4-4} = \frac{-4}{-8} = \frac{1}{2} \)

d) \( g\left(\frac{1}{2}\right) = \frac{\frac{1}{2}}{\frac{1}{2}-4} = \frac{\frac{1}{2}}{\frac{1}{2} \cdot \frac{8}{8}} = \frac{\frac{1}{2} \cdot 2}{\frac{1}{2} \cdot 8} = \frac{1}{4} \)

e) \( g(x^2) \)

In order to find \( g(x^2) \):

1. Put parenthesis around \( x \) in \( g(x) \).
   \[ g(x) = \frac{x}{x-4} \]

2. Replace “x” with “x^2” in the parenthesis.
   \[ g(x^2) = \frac{x^2}{x^2-4} \]
Find the domain of \( f(x) = \frac{\sqrt{x-1}}{x^2-9} \).

1. We need the expression under the square root to be \( \geq 0 \).
   \[ x - 1 \geq 0 \]
   \[ x \geq 1 \] if \( x \) is in the domain.

2. We need the denominator \( \neq 0 \).
   \[ x^2 - 9 \neq 0 \]
   \[ (x + 3)(x - 3) \neq 0 \]
   \[ x \neq -3 \text{ or } x \neq 3. \]

The domain is all real numbers \( \geq 1 \) except for \( x = 3 \).
Given \( f(x) = 3x - 1 \) find \( \frac{f(x+h) - f(x)}{h} \)

To figure out \( f(x+h) \):
1. Rewrite \( f(x) \) by placing \( x \) in parentheses.
   \[ f(x) = 3(x) - 1 \]
2. Replace each \( x \) with \( x + h \).
   \[ f(x+h) = 3(x+h) - 1 \]
   \[ f(x+h) = 3x + 3h - 1 \]

Substitute:
\[
\frac{f(x+h) - f(x)}{h} = \frac{3x + 3h - 1 - (3x - 1)}{h}
= \frac{3x + 3h - 1 - 3x + 1}{h}
= \frac{3h}{h}
= 3
\]

Given \( f(x) = x^2 + 3x - 6 \) find \( \frac{f(x+h) - f(x)}{h} \)

Find \( f(x+h) \):
1. Rewrite \( f(x) \) by placing ( ) around each \( x \):
   \[ f(x) = (x^2 + 3x - 6) \]
2. Replace each \( x \) with \( x + h \).
   \[ f(x+h) = (x+h)^2 + 3(x+h) - 6 \]
   \[ f(x+h) = x^2 + 2xh + h^2 + 3x + 3h - 6 \]

Substitute:
\[
\frac{f(x+h) - f(x)}{h} = \frac{x^2 + 2xh + h^2 + 3x + 3h - 6 - (x^2 + 3x - 6)}{h}
= \frac{x^2 + 2xh + h^2 + 3x + 3h - 6 - x^2 - 3x + 6}{h}
= \frac{2xh + h^2 + 3h}{h}
= \frac{h(2x + h + 3)}{h}
= 2x + h + 3
\]
\[ F(x) = \begin{cases} 
2x, & x > 3 \\
5, & x = 2 \\
4-x, & x < 2
\end{cases} \]

Find:

a) the domain
\[ x \leq 2 \quad \cup \quad x > 3 \]

b) \( F(2) = 5 \)

c) \( F(-2) = 4 - (-2) = 6 \)

d) \( F(5) = 2 + 5 = 7 \)
\[ f(x) = 2x + 3 \]
\[ g(x) = 3x - 2. \]

a) \((f \circ g)(x) = f(g(x))\)

\[ g(x) = 3x - 2. \]
To find \(f(g(x))\):

1. Rewrite \(f(x)\) by plugging \(1\) around each \(x\):
   \[ f(x) = 2x + 3 \]
2. Replace each "\(x\)" with "\(g(x)\)"
   \[ f(g(x)) = 2(g(x)) + 3 \]
   \[ = 2(3x - 2) + 3 \]
   \[ = 6x - 4 + 3 \]
   \[ = 6x - 1 \]

b) \((g \circ f)(x) = g(f(x))\).

1. \(g(x) = 3x - 2\)
2. \(g(f(x)) = 3(f(x)) - 2\)
   \[ = 3(2x + 3) - 2 \]
   \[ = 6x + 9 - 2 \]
   \[ = 6x + 7 \]
Tara earns $15/hr and Rich earns $18/hr.

a) Write $t(x)$ for Tara's earnings as a function of hours worked.
   Let $x$ be the # of hours worked.
   \[ t(x) = \text{rate/hr} \times \# \text{ of hours worked} \]
   \[ t(x) = 15x \]

b) Write $r(x)$ for Rich's earnings as a function of hours worked.
   \[ r(x) = \text{(rate/hr)} \times \# \text{ of hours} \]
   \[ r(x) = 18x \]

c) Assuming they work the same # of hours, write a function $(t+r)(x)$ for their combined earnings as a function of hr worked.
   \[ (t+r)(x) = t(x) + r(x) \]
   \[ (t+r)(x) = 15x + 18x \]
   \[ (t+r)(x) = 33x \]
a) \( f(-1) = 2 \)
b) \( f(0) = 2 \)
c) \( f(2) = 2 \)
d) \( f(3) = 2 \)
e) Domain of \( f(x) \): all real numbers
f) Range of \( f(x) \): all real numbers \( \geq 2 \),
Find the equation of a line with y-int 4 and slope \(-\frac{3}{2}\).

\[y = \frac{m}{x - x_0} = \frac{3}{4 - 6} = \frac{-3 + 7}{4 - 6} = \frac{4}{-2} = -2.\]

Find a general linear eqn for the line that passes thru \((4,3)\) and \((6,7)\).

1. Find slope:

\[y_1 - y_0 = \frac{y_1 - y_0}{x_1 - x_0} = \frac{3 - (-7)}{4 - 6} = \frac{-3 + 7}{4 - 6} = \frac{4}{-2} = -2.\]

2. Use point-slope form:

\[y - y_0 = m(x - x_0),\]
\[y - 3 = -2(x - 6),\]
\[y + 7 = -2x + 12,\]
\[2x + y - 5 = 0\]

Find the eqn of the vertical line thru \((3, -6)\).

Find horizontal line thru \((5, 6)\)

\[y = 6\]
Find the slope-int form of a line thru \((2,-3), (-4,7)\).

1. Find slope
\[ m = \frac{y_1 - y_0}{x_1 - x_0} = \frac{-3 - 7}{2 - (-4)} = \frac{-10}{6} = -\frac{5}{3}. \]

2. Use slope-int form:
\[ y = mx + b. \]
\[ -3 = -\frac{5}{3}(2) + b \]
\[ -3 = -\frac{10}{3} + b \]
\[ \frac{1}{3} = b \]
\[ y = -\frac{5}{3}x + \frac{1}{3} \]

Suppose \(f(x)\) is a linear function w/slope 5 and \(f(1) = 4\). Find \(f(x)\).

Use point-slope form:
\[ y - y_0 = m(x - x_0) \]
\[ y - 4 = 5(x - 1) \]
\[ y = 5x - 1 \]

Given \(f(x)\) is linear and \(f(-2) = 5, f(5) = 2\). Find \(f(x)\).

1. Find slope:
\[ m = \frac{y_1 - y_0}{x_1 - x_0} = \frac{5 - 2}{5 - (-2)} = \frac{3}{7} \]

2. Use point-slope form
\[ y - y_1 = m(x - x_1) \]
\[ y - 5 = -\frac{3}{7} (x - (-2)) \]
\[ y - 5 = -\frac{3}{7} (x + 2) \]
\[ y + 5 = -\frac{3}{7}x - \frac{6}{7} \]
\[ y = -\frac{3}{7}x + \frac{35}{7} \]
Suppose a manufacturer will place 1000 units on the market if the price is $10/unit and 1400 units if the price is $12. Find the supply equation if price and quantity are linearly related.

\[ p = \text{price} \]
\[ q = \text{quantity} \]

\[
\text{slope: } m = \frac{p_1 - p_0}{q_1 - q_0}
\]

\[ p_0 = 10 \quad p_1 = 12 \]
\[ q_0 = 1000 \quad q_1 = 1400 \]

\[ m = \frac{12 - 10}{1400 - 1000} = \frac{2}{400} = \frac{1}{200} \]

Use point-slope form:

\[ p - p_1 = m (q - q_1) \]

\[ p - 12 = \frac{1}{200} (q - 1400) \]

\[ p - 12 = \frac{1}{200} q - 7 \]

\[ p = \frac{1}{200} q + 5 \]
Suppose the cost to produce 100 units is $5000 and the cost to produce 125 units is $6000. If cost and output are linearly related, find an equation relating \( c \) and \( q \).

\[
m = \frac{c_1 - c_0}{q_1 - q_0} = \frac{5000 - 6000}{125 - 100} = \frac{-1000}{-25} = m = 40
\]

Use point-slope form:

\[
C - c_1 = m(q - q_1)
\]

\[
C - 5000 = 40(q - 100)
\]

\[
C = 40q - 4000
\]

\[
C = 40q + 1000
\]
The demand for an automobile is 400 when the price is $16,700 and 500 if the price is $14,900. Find the demand eqn if this relation is linear.

Let \( q \) be \# of units
\( p \) be the price.

1. Find slope
\[
m = \frac{p_1 - p_0}{q_1 - q_0} = \frac{16,700 - 14,900}{500 - 400} = \frac{1,800}{100} = -18.
\]

2. Use point-slope form:
\[
p - p_1 = m(q - q_0)
\]
\[
p - 14,900 = -18(q - 500)
\]
\[
p - 14,900 = -18q + 9,000
\]
\[
p = -18q + 23,900
\]
The demand for a company is 
\[ p = 300 - 5q \]
where \( p \) is the price per unit and \( q \) is the quantity demanded. Find the production level that maximizes the total revenue, and find this revenue.

i) Find production level.

\[
\text{total revenue} = p \times q = (300 - 5q)q
\]

\[
r = 300q - 5q^2
\]

\[
r = -5q^2 + 300q
\]

\[
q_{\text{max}} = -\frac{b}{2a} = -\frac{300}{2(-5)} = 30
\]

ii) Find max rev:

\[
r = -5q^2 + 300q
\]

\[
r_{\text{max}} = -5(30)^2 + 300(30)
\]

\[
r_{\text{max}} = -5(900) + 9000
\]

\[
r_{\text{max}} = 4500
\]