Chapter 7 Review

Chapter 7 Review   Page 410   Question 1

a) $|-5| = 5$

b) $\left|2\frac{3}{4}\right| = 2\frac{3}{4}$

c) $|-6.7| = 6.7$

Chapter 7 Review   Page 410   Question 2

First, evaluate each number and express it in decimal form.

-4 $\sqrt{9} = 3$ $|-3.5| = 3.5$ -2.7 $\left|-\frac{9}{2}\right| = 4.5$ $|-1.6| = 1.6$ $\left|1\frac{1}{2}\right| = 1.5$

The numbers from least to greatest are -4, -2.7, $\left|1\frac{1}{2}\right|$, $|-1.6|$, $\sqrt{9}$, $|-3.5|$, and $\left|-\frac{9}{2}\right|$.

Chapter 7 Review   Page 410   Question 3

a) $|-7 - 2| = |-9|$
$= 9$

b) $|-3 + 11 - 6| = |2|$
$= 2$

c) $5|-3.75| = 5(3.75)$
$= 18.75$

d) $|5^2 - 7| + |-10 + 2^3| = |25 - 7| + |-10 + 8|$
$= |18| + |-2|$
$= 18 + 2$
$= 20$

Chapter 7 Review   Page 410   Question 4

Let $D_1 = 0.0$, $D_2 = 4.2$, $D_3 = 10.5$, $D_4 = 19.6$, $D_5 = 21.9$, and $D_6 = 15.0$.

$|D_2 - D_1| + |D_3 - D_2| + |D_4 - D_3| + |D_5 - D_4| + |D_6 - D_5| + |D_1 - D_5|$
$= |4.2 - 0.0| + |10.5 - 4.2| + |19.6 - 10.5| + |21.9 - 19.6| + |15.0 - 21.9| + |0.0 - 15.0|$
$= |4.2| + |6.3| + |9.1| + |2.3| + |-6.9| + |-15.0|$
$= 4.2 + 6.3 + 9.1 + 2.3 + 6.9 + 15$
$= 43.8$

The total distance hiked was 43.8 km.

Chapter 7 Review Page 410 Question 5

a) The net change in the closing value of this stock is the change from the start of the week to the end of the week: \$6.40 – \$4.28 = \$2.12.

b) Let $V_1 = 4.28$, $V_2 = 5.17$, $V_3 = 4.79$, $V_4 = 7.15$, and $V_5 = 6.40$.

$|V_2 - V_1| + |V_3 - V_2| + |V_4 - V_3| + |V_5 - V_4|$

$= |5.17 - 4.28| + |4.79 - 5.17| + |7.15 - 4.79| + |6.40 - 7.15|$

$= |0.89| + |-0.38| + |2.36| + |-0.75|$

$= 0.89 + 0.38 + 2.36 + 0.75$

$= 4.38$

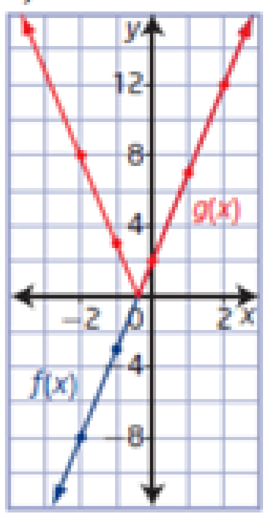
The total change in the closing value of this stock is \$4.38.

Chapter 7 Review Page 410 Question 6

a)

x	$f(x)$	$g(x)$
–2	–8	8
–1	–3	3
0	2	2
1	7	7
2	12	12

b)



c) For $f(x)$: The domain is $\{x \mid x \in R\}$ and the range is $\{y \mid y \in R\}$.
For $g(x)$: The domain is $\{x \mid x \in R\}$ and the range is $\{y \mid y \geq 0, y \in R\}$.

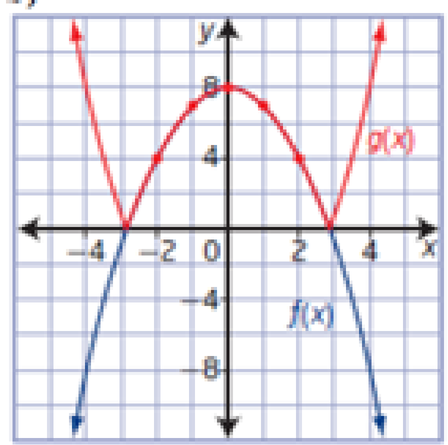
d) Example: They are the same graph for values of x where $f(x) \geq 0$. Otherwise, the graph of $g(x)$ is a reflection of the graph of $f(x)$ in the x-axis.

Question 7

a)

x	$f(x)$	$g(x)$
–2	4	4
–1	7	7
0	8	8
1	7	7
2	4	4

b)



c) For $f(x)$: The domain is $\{x \mid x \in R\}$ and the range is $\{y \mid y \leq 8, y \in R\}$.
For $g(x)$: The domain is $\{x \mid x \in R\}$ and the range is $\{y \mid y \geq 0, y \in R\}$.

d) Example: They are the same graph for values of x where $f(x) \geq 0$. Otherwise, the graph of $g(x)$ is a reflection of the graph of $f(x)$ in the x-axis.

Chapter 7 Review Page 411 Question 8

a) The x-intercept is $x = 2$. When $x \geq 2$, the graph of $y = |2x - 4|$ is the graph of $y = 2x - 4$. When $x < 2$, the graph of $y = |2x - 4|$ is the graph of $y = -(2x - 4)$ or $y = -2x + 4$. The absolute value function $y = |2x - 4|$ expressed as a piecewise function is

$$y = \begin{cases} 2x - 4, \text{ if } x \geq 2 \\ -2x + 4, \text{ if } x < 2 \end{cases}.$$

b) The x-intercepts are $x = -1$ and $x = 1$. When $x \leq -1$ or $x \geq 1$, the graph of $y = |x^2 - 1|$ is the graph of $y = x^2 - 1$. When $-1 < x < 1$, the graph of $y = |x^2 - 1|$ is the graph of $y = -(x^2 - 1)$ or $y = -x^2 + 1$. The absolute value function $y = |x^2 - 1|$ expressed as a piecewise function is $y = \begin{cases} x^2 - 1, \text{ if } x \leq -1 \text{ or } x \geq 1 \\ -x^2 + 1, \text{ if } -1 < x < 1 \end{cases}$.

Chapter 7 Review Page 411 Question 9

a) The functions $f(x) = 3x^2 + 7x + 2$ and $g(x) = |3x^2 + 7x + 2|$ have different graphs because the initial graph goes below the x-axis. The absolute value brackets reflect anything below the x-axis above the x-axis.

b) The functions $f(x) = 3x^2 + 4x + 2$ and $g(x) = |3x^2 + 4x + 2|$ have the same graphs because the initial function is always positive (above the x-axis).

Chapter 7 Review Page 411 Question 10

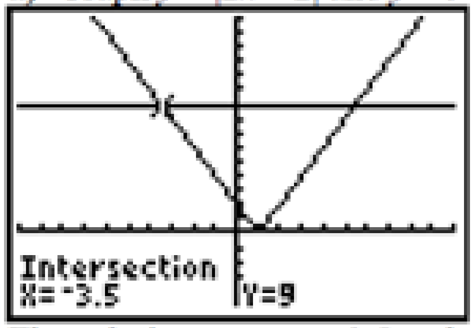
Determine the equation of the line in the form $f(x) = ax + b$ using the two given points:
$\left(-\frac{2}{3}, 0\right)$ and $(0, 10)$.

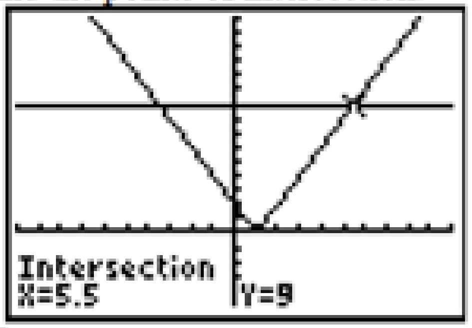
$f(x) = 15x + 10$

Therefore, $a = 15$ and $b = 10$.

Chapter 7 Review Page 411 Question 11

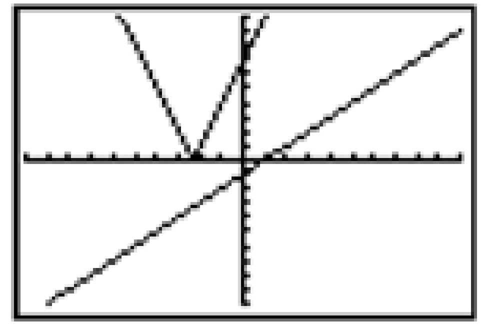
a) Graph $y = |2x - 2|$ and $y = 9$ and find the points of intersection.



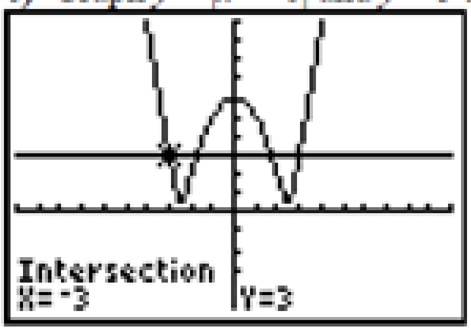


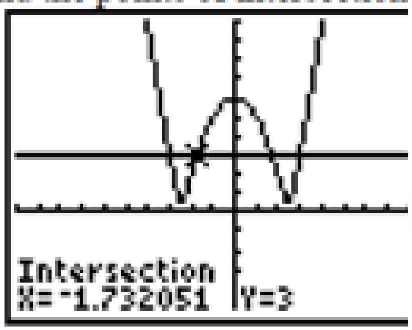
The solutions are $x = -3.5$ and $x = 5.5$.

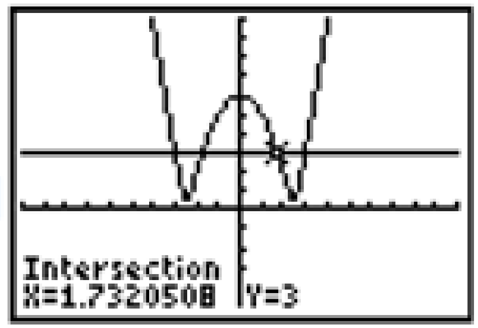
b) Graph $y = |7 + 3x|$ and $y = x - 1$ and find the points of intersection.
Since the graphs do not intersect, there is no solution.

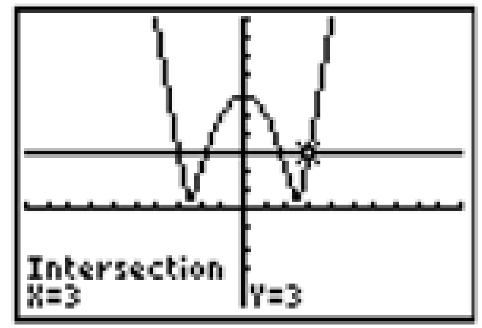


c) Graph $y = |x^2 - 6|$ and $y = 3$ and find the points of intersection.



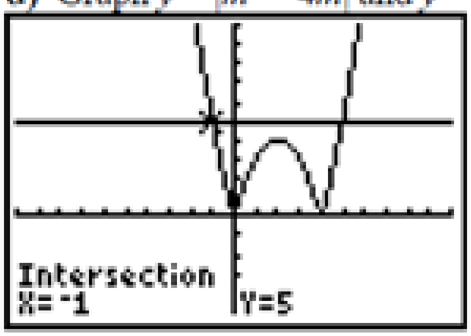


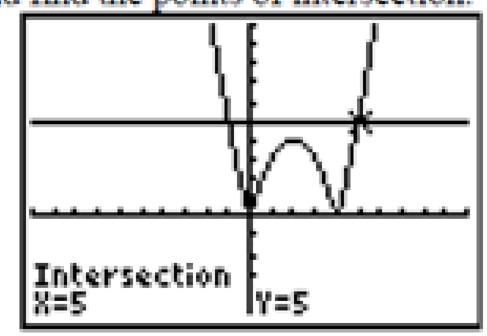




The solutions are $x = -3$, $x \approx -1.7$, $x \approx 1.7$, and $x = 3$.

d) Graph $y = |m^2 - 4m|$ and $y = 5$ and find the points of intersection.





The solutions are $m = -1$ and $m = 5$.

a) Examine the two cases.

Case 1

The expression $|q + 9|$ equals $q + 9$ when $q \geq -9$.

$q + 9 = 2$

$q = -7$

The value -7 satisfies the condition $q \geq -9$.

Case 2

The expression $|q + 9|$ equals $-(q + 9)$ when $q < -9$.

$-(q + 9) = 2$

$q + 9 = -2$

$q = -11$

The value -11 satisfies the condition $q < -9$.

The solution is $q = -7$ or $q = -11$.

b) Examine the two cases.

Case 1

The expression $|7x - 3|$ equals $7x - 3$ when $x \geq \frac{3}{7}$.

$7x - 3 = x + 1$

$6x = 4$

$x = \frac{2}{3}$

The value $\frac{2}{3}$ satisfies the condition $x \geq \frac{3}{7}$.

Case 2

The expression $|7x - 3|$ equals $-(7x - 3)$ when $x < \frac{3}{7}$.

$-(7x - 3) = x + 1$

$-7x + 3 = x + 1$

$-8x = -2$

$x = \frac{1}{4}$

The value $\frac{1}{4}$ satisfies the condition $x < \frac{3}{7}$.

The solution is $x = \frac{2}{3}$ or $x = \frac{1}{4}$.

c) Examine the two cases.

Case 1

The expression $|x^2 - 6x|$ equals $x^2 - 6x$ when $x \leq 0$ or $x \geq 6$.

$x^2 - 6x = x$

$x^2 - 7x = 0$

$x(x - 7) = 0$

$x = 0$ or $x - 7 = 0$

$x = 7$

Both values 0 and 7 satisfy the conditions.

Case 2

The expression $|x^2 - 6x|$ equals $-(x^2 - 6x)$ when $0 < x < 6$.

$-(x^2 - 6x) = x$

$0 = x^2 - 5x$

$0 = x(x - 5)$

$x = 0$ or $x - 5 = 0$

$x = 5$

Only the value 5 satisfies the conditions.

The solution is $x = 0$, $x = 5$, or $x = 7$.

d) Examine the two cases.

Case 1

The expression $|4x^2 - x - 4|$ equals $4x^2 - x - 4$ when $x \le \frac{1-\sqrt{65}}{8}$ or $x \ge \frac{1+\sqrt{65}}{8}$ or approximately $x \le -0.88$ or $x \ge 1.13$.

$$3x - 1 = 4x^2 - x - 4$$
$$0 = 4x^2 - 4x - 3$$
$$0 = (2x + 1)(2x - 3)$$

$2x + 1 = 0$ or $2x - 3 = 0$

$x = -\frac{1}{2}$ $\quad$ $x = \frac{3}{2}$

Only the value $\frac{3}{2}$ satisfies the conditions.

Case 2

The expression $|4x^2 - x - 4|$ equals $-(4x^2 - x - 4)$ when $\frac{1-\sqrt{65}}{8} < x < \frac{1+\sqrt{65}}{8}$ or approximately $-0.88 < x < 1.13$.

$$3x - 1 = -(4x^2 - x - 4)$$
$$3x - 1 = -4x^2 + x + 4$$
$$4x^2 + 2x - 5 = 0$$
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
$$x = \frac{-(2) \pm \sqrt{(2)^2 - 4(4)(-5)}}{2(4)}$$
$$x = \frac{-2 \pm \sqrt{84}}{8}$$
$$x = \frac{-1 \pm \sqrt{21}}{4}$$

$x = \frac{-1+\sqrt{21}}{4}$ or $x = \frac{-1-\sqrt{21}}{4}$

$x = 0.8956\ldots$ $\quad$ $x = -1.3956\ldots$

Only the value of $\frac{-1+\sqrt{21}}{4}$ satisfies the conditions.

The solution is $x = \frac{3}{2}$ or $x = \frac{-1+\sqrt{21}}{4}$.

Chapter 7 Review Page 411 Question 13

a) Examine the two cases.
Case 1
The expression $|d - 4.075|$ equals $d - 4.075$ when $d \geq 4.075$.
$d - 4.075 = 1.665$
$d = 5.74$
The value 5.74 satisfies the condition.
Case 2
The expression $|d - 4.075|$ equals $-(d - 4.075)$ when $d < 4.075$.
$-(d - 4.075) = 1.665$
$d - 4.075 = -1.665$
$d = 2.41$
The value 2.41 satisfies the condition.
The solution is $d = 5.74$ or $d = 2.41$.
The depth of the water at high tide is 5.74 m, and the depth of the water at low tide is 2.41 m.

b) Let $D_1 = 2.94$, $D_2 = 5.71$, $D_3 = 2.28$, and $D_4 = 4.58$.
$|D_2 - D_1| + |D_3 - D_2| + |D_4 - D_3|$
$= |5.71 - 2.94| + |2.28 - 5.71| + |4.58 - 2.28|$
$= |2.77| + |-3.43| + |2.3|$
$= 2.77 + 3.43 + 2.3$
$= 8.5$
The total change in water depth that day was 8.5 m.

Chapter 7 Review Page 412 Question 14

Examine the two cases.

Case 1

The expression $|m - 35.932|$ equals $m - 35.932$ when $m \geq 35.932$.

$m - 35.932 = 11.152$

$m = 47.084$

The value 47.084 satisfies the condition.

Case 2

The expression $|m - 35.932|$ equals $-(m - 35.932)$ when $m < 35.932$.

$-(m - 35.932) = 11.152$

$m - 35.932 = -11.152$

$m = 24.78$

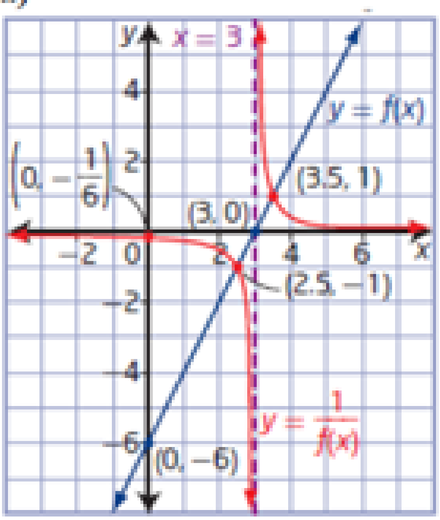
The value 24.78 satisfies the condition.

The solution is $m = 47.084$ or $m = 24.78$.

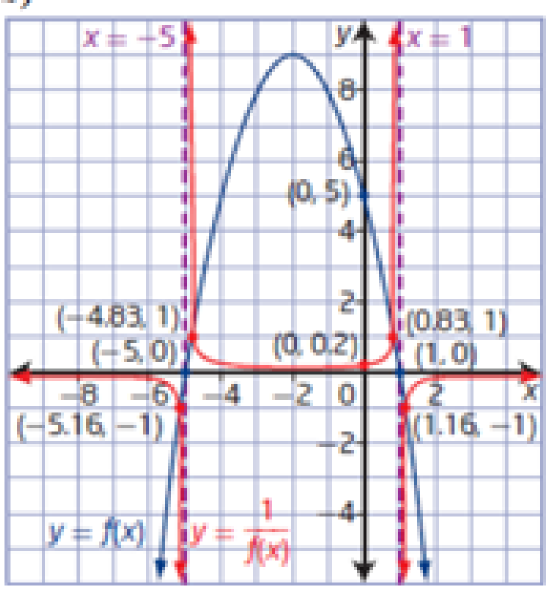
The two masses are 24.78 kg and 47.084 kg.

Chapter 7 Review Page 412 Question 15

a)

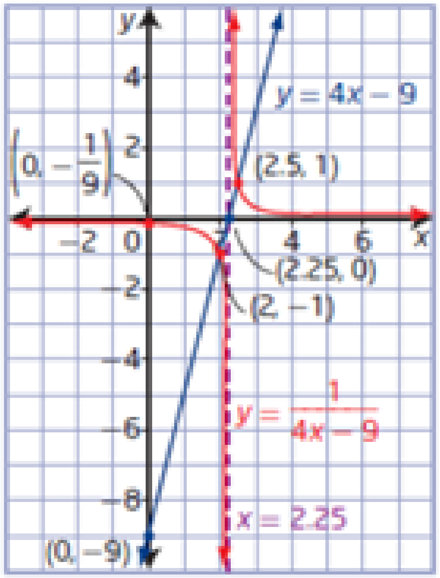


b)

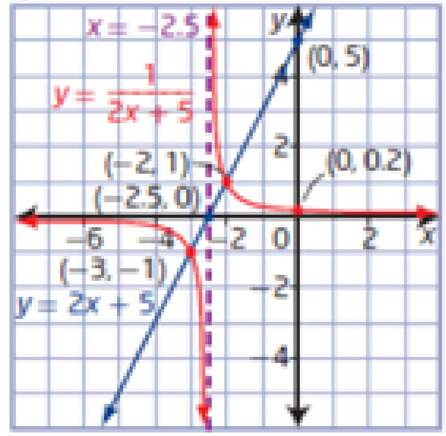


Chapter 7 Review Page 412 Question 16

a)



b)



Chapter 7 Review Page 412 Question 17

a) i) The reciprocal function for $f(x) = x^2 - 25$ is $y = \frac{1}{x^2 - 25}$.

ii) Find the non-permissible values of $\frac{1}{x^2 - 25}$ by setting the denominator equal to 0 and solving.

$x^2 - 25 = 0$

$(x - 5)(x + 5) = 0$

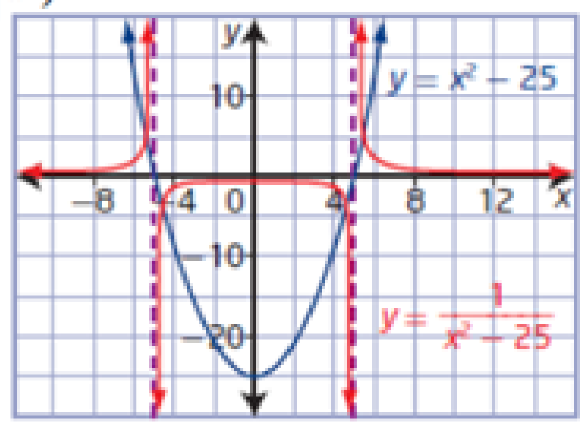
$x - 5 = 0$ or $x + 5 = 0$

$x = 5$ $x = -5$

The non-permissible values and the equations of the asymptotes are $x = 5$ and $x = -5$.

iii) The reciprocal function has no x-intercepts. The y-intercept is $-\frac{1}{25}$.

iv)



b) i) The reciprocal function for $f(x) = x^2 - 6x + 5$ is $y = \frac{1}{x^2 - 6x + 5}$.

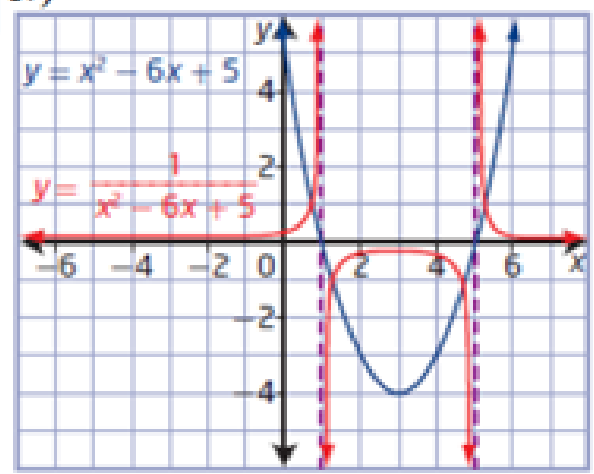
ii) Find the non-permissible values of $\frac{1}{x^2 - 6x + 5}$ by setting the denominator equal to 0 and solving.

$x^2 - 6x + 5 = 0$
$(x - 5)(x - 1) = 0$
$x - 5 = 0$ or $x - 1 = 0$
$x = 5$ $x = 1$

The non-permissible values and the equations of the asymptotes are $x = 5$ and $x = 1$.

iii) The reciprocal function has no x-intercepts. The y-intercept is $\frac{1}{5}$.

iv)



Chapter 7 Review Page 412 Question 18

a) Substitute $d = 2.5$ into $F = \frac{600}{d}$.

$F = \frac{600}{d}$

$F = \frac{600}{2.5}$

$F = 240$

The force required is 240 N.

b) Substitute $F = 450$ into $F = \frac{600}{d}$.

$F = \frac{600}{d}$

$450 = \frac{600}{d}$

$d = 1.333...$

The distance from the fulcrum is approximately 1.33 m.

c) If the distance is doubled:

$F_d = \frac{600}{2d}$

$F_d = \frac{1}{2}\left(\frac{600}{d}\right)$

$F_d = \frac{1}{2}F$

If the distance is tripled:

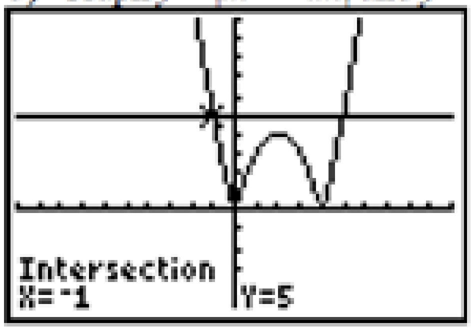
$F_t = \frac{600}{3d}$

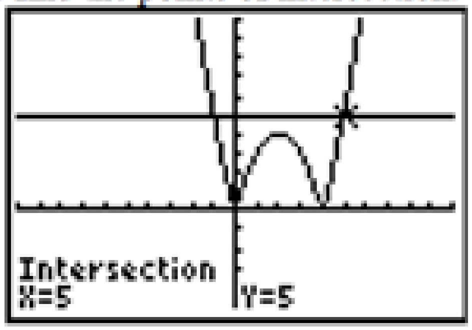
$F_t = \frac{1}{3}\left(\frac{600}{d}\right)$

$F_t = \frac{1}{3}F$

If the distance is doubled the force is halved. If the distance is tripled only a third of the force is needed.

d) Graph $y = |m^2 - 4m|$ and $y = 5$ and find the points of intersection.





The solutions are $m = -1$ and $m = 5$.