MTH-4111 Quiz #1

Name:

Date:

Solve the following systems of equations. Round off your answers to the nearest tenth. Clearly show all the steps in your **algebraic** solutions. (5 marks each)

1. $y = -5x^2$

$$5x + \frac{5}{8}y - 2 = 0$$

2. $y = -x^2 - 2x - 9$

$$y = \frac{1}{2}x + 2.5$$

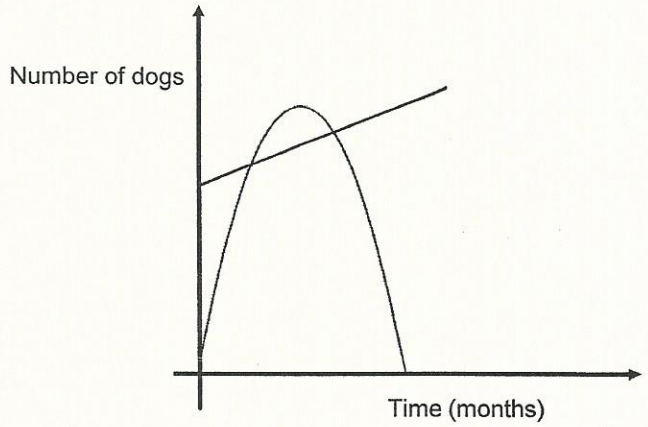
Name: _____

Math 4111 Quiz: Word Problem Involving Solving a System of Equations

Over a 30-month period a government worker tracks the population of dogs at two different urban shelters.
The number of dogs present at Shelter A over the period is represented by a parabola.
At the beginning of the period there are only 8 dogs at the shelter. The number of sheltered dogs at Shelter A reaches a peak of 116 dogs after 12 months.

The variation in the number of dogs at Shelter B is represented by a straight line.
The initial number of dogs here is 80; after 16 months, the number increased by 30%.

Determine the number of months in which there were more dogs at Shelter A than at Shelter B.



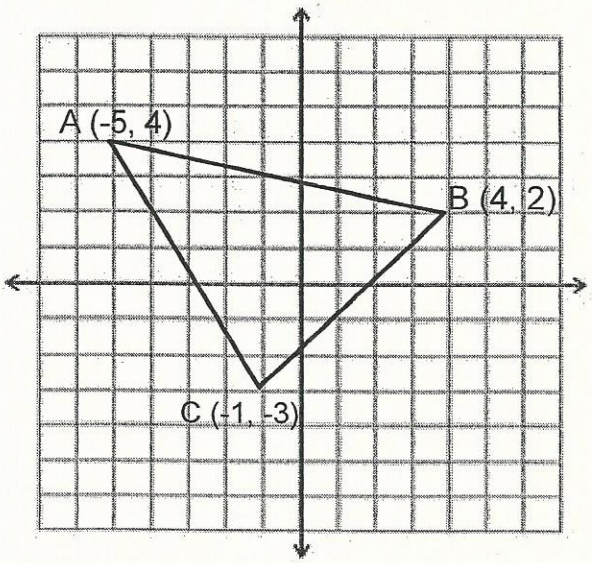
Answer: _____

Name: _____

Quiz: Triangle Geometry

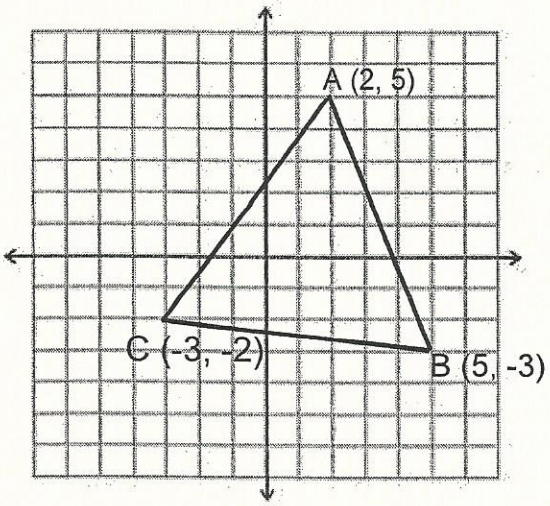
1. Determine the equation of the altitude drawn from vertex A.

   Clearly show all your work.



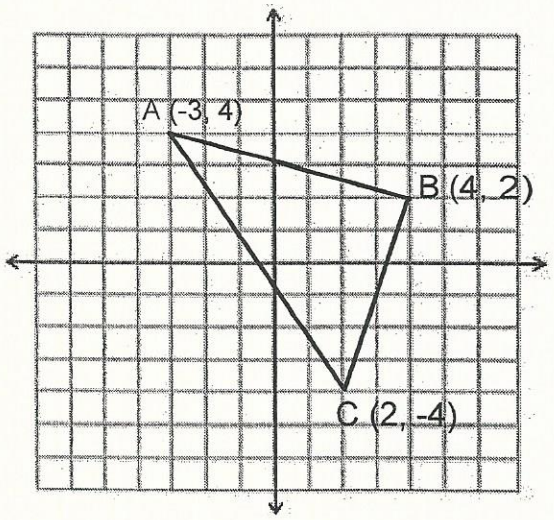
Ans: _____

2. Determine the equation of the perpendicular bisector of side AC.
Clearly show all your work.



Ans: _____

3. Calculate the area of triangle ABC. Round off your answer to the nearest unit. Clearly show all your work.



Ans: _____

July 10, 2013

Name: _____

Quiz: Equivalent Figures

1. The Brown family is considering purchasing a freezer. They learn that there are two equivalent varieties sold at a nearby furniture store. The length of the upright is 90 cm.

   The length of the chest is $1\frac{1}{2}$ times the length of the upright.

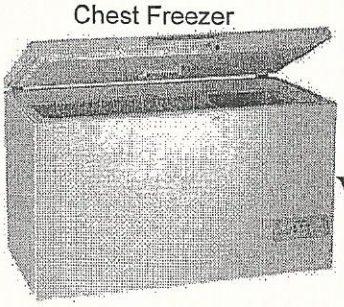
   The height of the chest is 4 cm more than twice its width.

   The height of the upright is $2\frac{3}{5}$ times the width of the chest.

   The width of the upright is 44 cm less than the height of the chest.

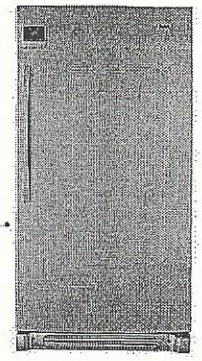
   How much greater is the width of the upright compared with the width of the chest?

Chest Freezer



VS.

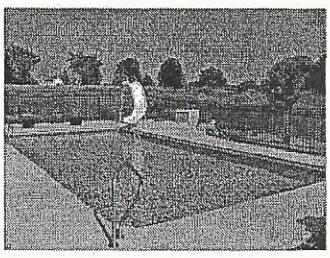
Upright Freezer



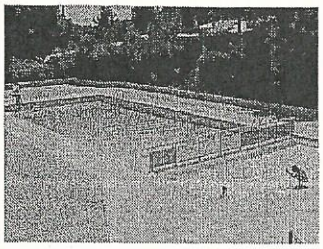
Ans: _____

2. A water park has an adult pool and a baby pool. These pools hold equivalent volumes of water. The baby pool is 50cm deep and the adult pool is four times as deep as the baby pool. The length of the adult pool is 2.5X the width of the baby pool. The baby pool is 4000cm longer than the adult pool. The width of the adult pool is half its length. By how many centimeters does the width of the adult pool exceed the width of the baby pool?

Adult Pool



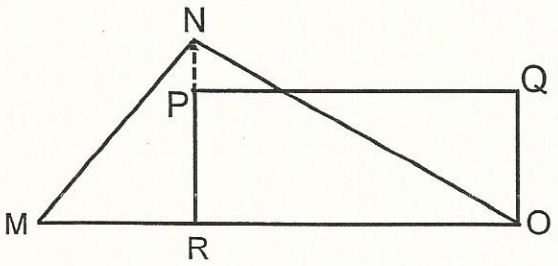
Baby Pool



Ans:_____

3. Rectangle PQOR cuts triangle MNO as shown in the figure below:
   Side MO is 10cm long.
   Side OR is 4cm longer than side PR.
   Altitude NR of the triangle, formed by extending side RP, is 1cm longer than side RP.
   Triangle MNO and rectangle PQOR are equivalent.

   What is the measure, in centimetres, of altitude NR of triangle MNO?
   Round off your answer to the nearest hundredth. Clearly show all your work.



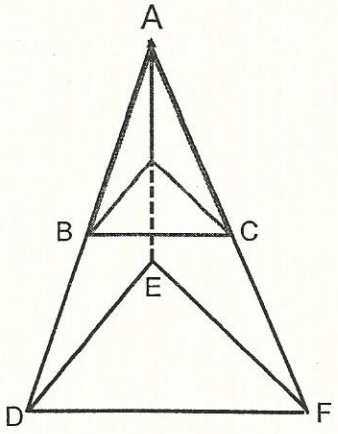
Ans: _____

Quiz: Ratios of Similarity

Name: _____

1. The volume of the smaller pyramid (outlined in purple) below is 16 cm^3. Points B and C are the midpoints of sides AD and AF respectively.

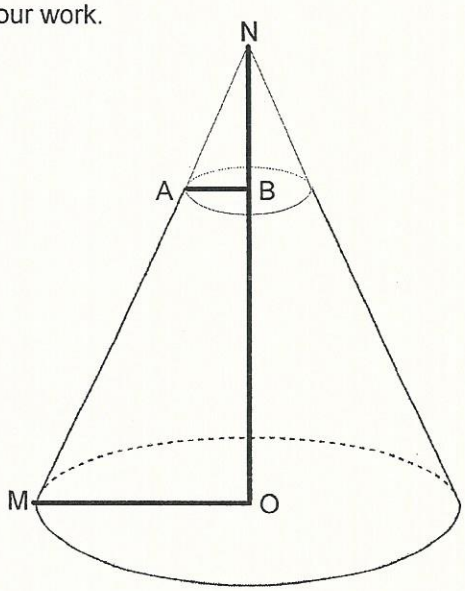
   What is the volume of the larger pyramid?



Ans:_____

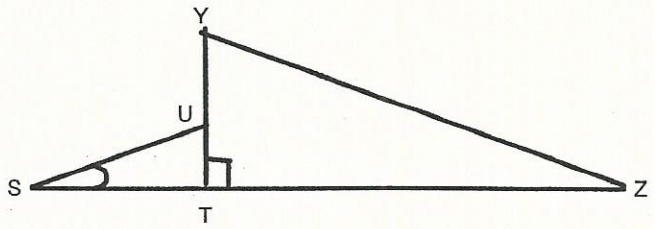
2. Two cones are created by rotating triangles MNO and ABN. Points A and B divide sides NM and NO each in a ratio of 1:2. The volume of the smaller cone, formed by triangle ABN is 46 cm^3. Determine the volume of the larger cone formed from triangle MNO.

Clearly show all your work.



Ans: _____

3. A figure is composed of two similar right triangles STU and TYZ.



Side TU measures 2 cm, segment UY measures 3.4 cm, and angle <TSU measures 19.° Calculate the total area of the figure.

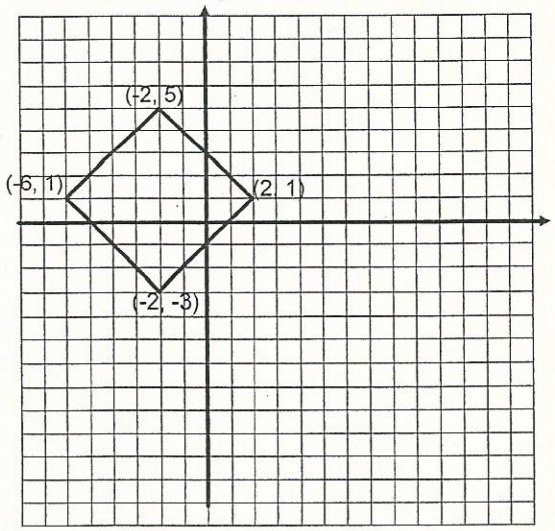
Round off your answer to the nearest tenth. Clearly show the steps in the solution and

the geometry principle(s) you used.

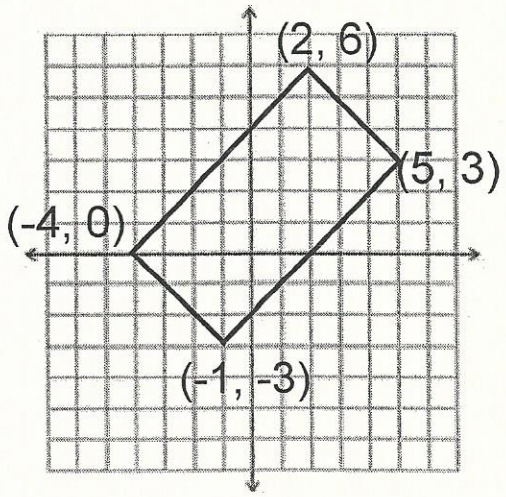
Ans: _____

July 10, 2013

Prove that the quadrilateral below is a square:



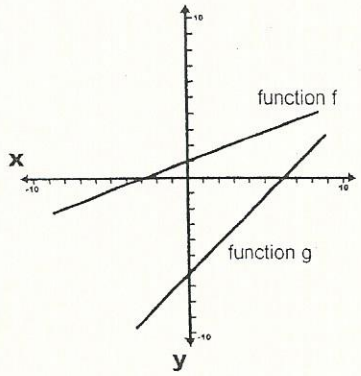
Prove that the quadrilateral below is a rectangle.



Name:

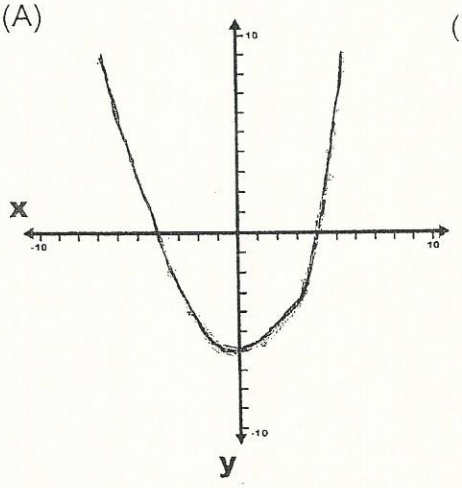
Quiz: Graphs Involving Operations on Functions

1. The following graph represents functions f and g:

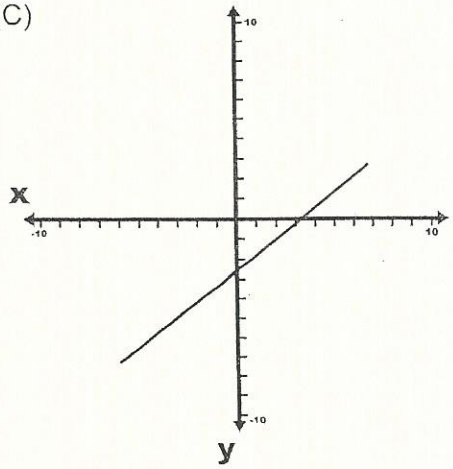


Which one of the following graphs could represent f • g ?

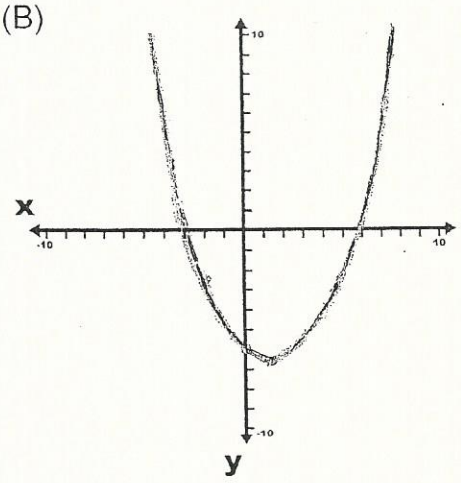
(A)



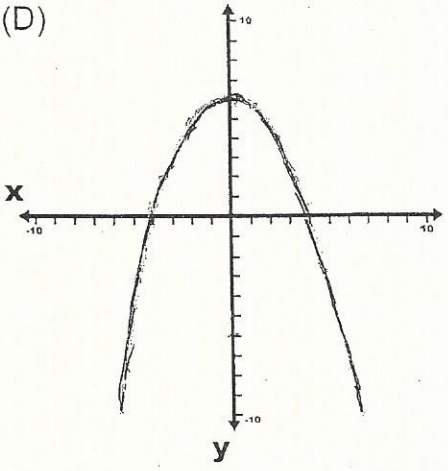
(C)



(B)



(D)



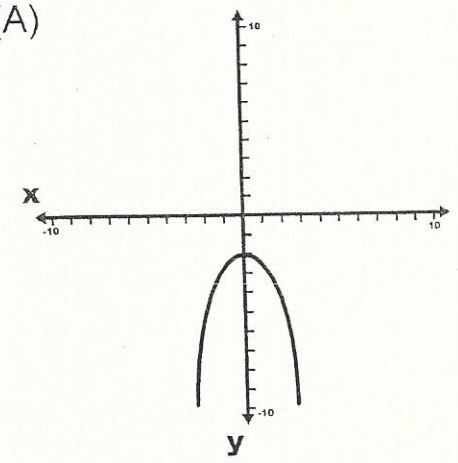
2. Functions f and g are defined as follows:

$f(x) = a_1x^2$ where $a_1 > 0$

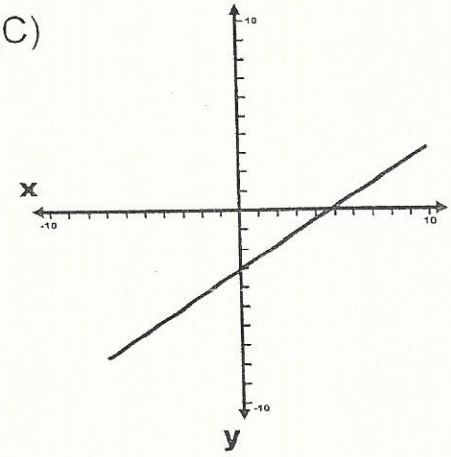
$g(x) = a_2x^2 + c$ where $a_2 = -a_1$ and $c < 0$

Which one of the following graphs could represent f + g ?

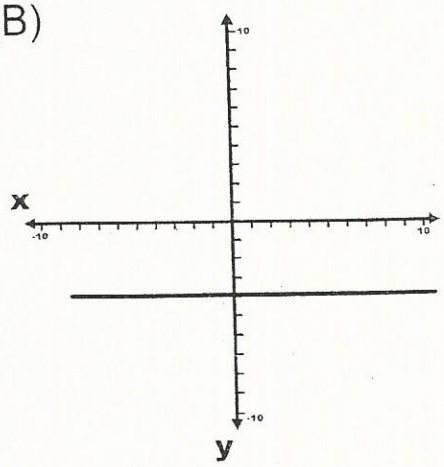
(A)



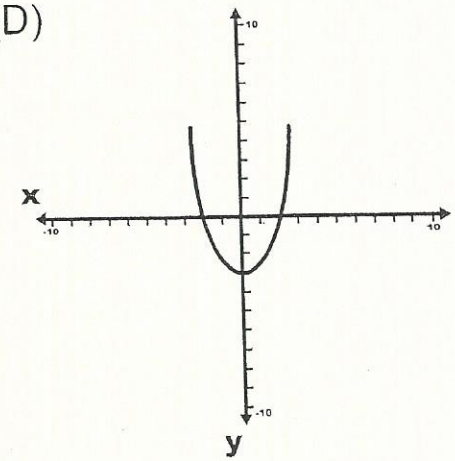
(C)



(B)



(D)



MTH-4111 Quiz #1

Name: Shannon

Date:

Solve the following systems of equations. Round off your answers to the nearest tenth. Clearly show all the steps in your **algebraic** solutions. (5 marks each)

1. $y = -5x^2$

$5x + \frac{5}{8}y - 2 = 0$

$\frac{8}{5}\left(\frac{5}{8}y\right) = (-5x + 2)\frac{8}{5}$

$y = -8x + 3.2$

$Y = Y$

$-5x^2 = -8x + 3.2$

$-5x^2 + 8x - 3.2 = 0$

a b c

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-8 \pm \sqrt{8^2 - 4(-5)(-3.2)}}{2(-5)}$

$= \frac{-8 \pm \sqrt{64 - 64}}{-10}$

$x = \frac{-8 \pm 0}{-10} = 0.8$

$y = -5x^2$

$= -5(0.8)^2$

$= -0.32$

Solution:

(0.8, -3.2)

---

2. $y = -x^2 - 2x - 9$

$y = \frac{1}{2}x + 2.5$

$Y = Y$

$-x^2 - 2x - 9 = \frac{1}{2}x + 2.5$

$-x^2 - 2x - 9 - \frac{1}{2}x - 2.5 = 0$

$-1x^2 - 2.5x - 11.5 = 0$

a b c

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{2.5 \pm \sqrt{(-2.5)^2 - 4(-1)(-11.5)}}{2(-1)}$

$= \frac{2.5 \pm \sqrt{6.25 - 46}}{-2}$

No solution since you can't square-root a negative number.

Name: Shannon

Math 4111 Quiz: Word Problem Involving Solving a System of Equations

Over a 30-month period a government worker tracks the population of dogs at two different urban shelters.
The number of dogs present at Shelter A over the period is represented by a parabola.
At the beginning of the period there are only 8 dogs at the shelter. The number of sheltered dogs at Shelter A reaches a peak of 116 dogs after 12 months.

The variation in the number of dogs at Shelter B is represented by a straight line.
The initial number of dogs here is 80; after 16 months, the number increased by 30%.

Determine the number of months in which there were more dogs at Shelter A than at Shelter B.

Parabola: $(0,8)$ $(12,116)$
$x\ y$ $h\ k$

$y = a(x-h)^2 + k$

$8 = a(0-12)^2 + 116$

$8 = 144a + 116$

$-144a = 116 - 8$

$\frac{-144a}{-144} = \frac{108}{-144}$

$a = -0.75$

$y = -0.75(x-12)^2 + 116$

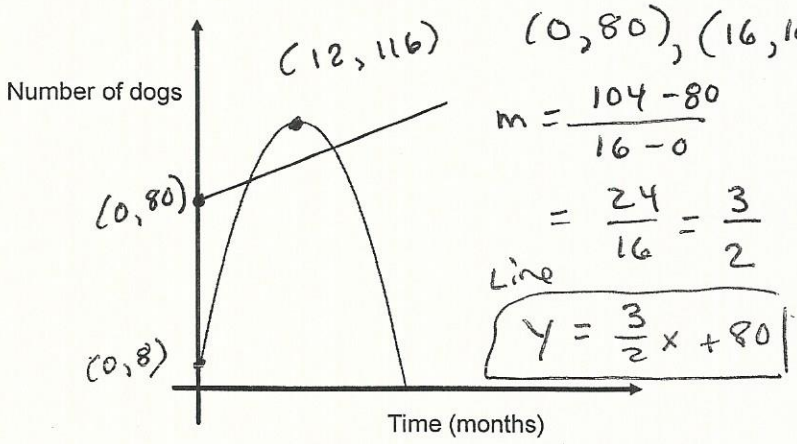
$y = -0.75(x-12)(x-12) + 116$

$y = -0.75(x^2 - 24x + 144) + 116$

$y = -0.75x^2 + 18x - 108 + 116$

Parabola $= -0.75x^2 + 18x + 8$

Answer: 10 months



Line

$(0,80), (16,104)$

$m = \frac{104-80}{16-0}$

$= \frac{24}{16} = \frac{3}{2}$

Line $y = \frac{3}{2}x + 80$

$y_p = y_L$

$-0.75x^2 + 18x + 8 = 1.5x + 80$

$-0.75x^2 + 18x - 1.5x + 8 - 80 = 0$

$-0.75x^2 + 16.5x - 72 = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-16.5 \pm \sqrt{(16.5)^2 - 4(-0.}}{2(-0.75)}$ $(-72$

$$x = \frac{-16.5 \pm \sqrt{(16.5)^2 - 4(-0.75)(-72)}}{2(-0.75)}$$

$$= \frac{-16.5 \pm \sqrt{272.25 - 216}}{-1.5}$$

$$= \frac{-16.5 \pm \sqrt{56.25}}{-1.5}$$

$$= \frac{-16.5 \pm 7.5}{-1.5}$$

(+) $\rightarrow \frac{-16.5 + 7.5}{-1.5} = 6$

(−) $\rightarrow \frac{-16.5 - 7.5}{-1.5} = 16$

$16 - 6 =$

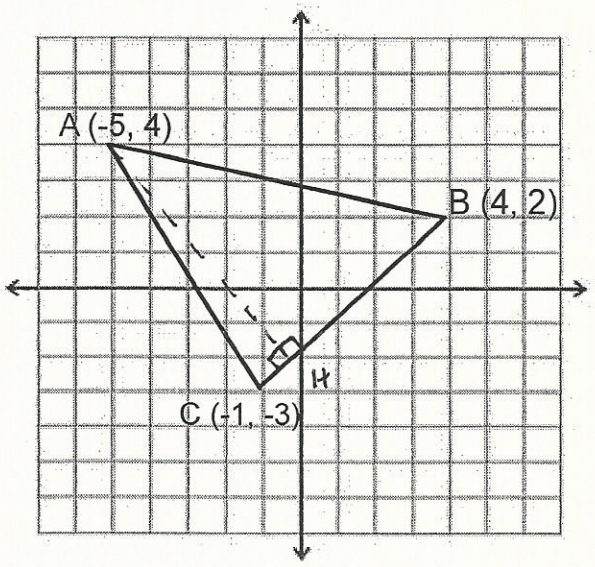
10 months

Name: Shannon

Quiz: Triangle Geometry

1. Determine the equation of the altitude drawn from vertex A.

   Clearly show all your work.



$m_{BC} = \frac{2+3}{4+1} = \frac{5}{5} = 1$

$m_{AH} = -1$

$(-5, 4)$
$x \quad y$

$y = mx + b$

$4 = (-1)(-5) + b$

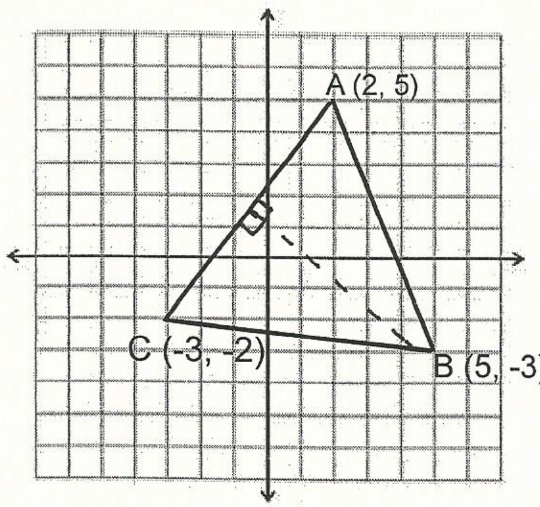
$4 = 5 + b$

$4 - 5 = b$

$-1 = b$

Ans: $y = -x - 1$

2. Determine the equation of the perpendicular bisector of side AC.
Clearly show all your work.



$$M_{AC} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$= \left(\frac{2 - 3}{2}, \frac{5 - 2}{2}\right)$$

$$= \left(\frac{-1}{2}, \frac{3}{2}\right)$$

$$= (-0.5, 1.5)$$

$$m_{AC} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 + 2}{2 + 3} = \frac{7}{5}$$

$$m_{\text{perp. bisector}} = \frac{-5}{7} \qquad \begin{matrix}(-0.5, & 1.5) \\ x & y\end{matrix}$$

$$y = mx + b$$

$$1.5 = \left(-\frac{5}{7}\right)(-0.5) + b \qquad \text{OR} \qquad \frac{3}{2} = \left(-\frac{5}{7}\right)\left(-\frac{1}{2}\right) + b$$

$$1.5 = 0.35714 + b \qquad \frac{3}{2} = \frac{5}{14} + b$$

$$1.5 - 0.35714 = b \qquad \frac{3 \cdot 7}{2 \cdot 7} - \frac{5}{14} = b$$

$$1.14 = b \qquad \frac{21}{14} - \frac{5}{14} = b$$

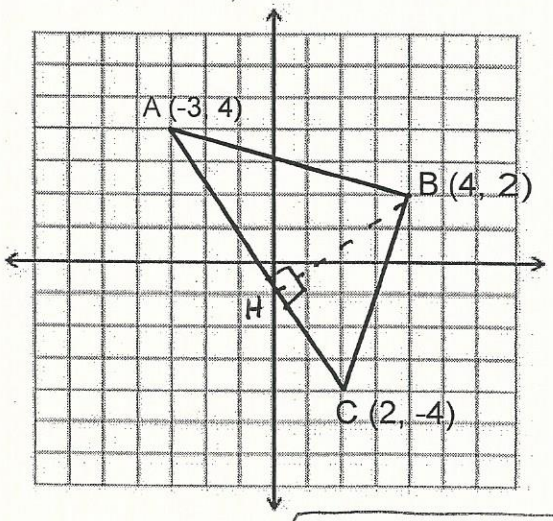
$$\frac{16}{14} = b$$

Ans: $y = \frac{-5}{7}x + 1.14$

$$\frac{8}{7} = b$$

OR $y = -\frac{5}{7}x + \frac{8}{7}$

3. Calculate the area of triangle ABC. Round off your answer to the nearest unit.
Clearly show all your work.



$m_{AC} = \frac{4+4}{-3-2} = \frac{8}{-5}$ (-3, 4) x y

$y = mx + b$

$4 = \left(-\frac{8}{5}\right)\left(\frac{-3}{1}\right) + b$

$4 = \frac{24}{5} + b$

$4 - 4.8 = b$

$-0.8 = b$

Eqn AC $\Rightarrow$ $y = -\frac{8}{5}x - 0.8$

$m_{BH} = +\frac{5}{8}$ (4, 2) x y

$y = mx + b$

$2 = \left(\frac{5}{8}\right)\left(\frac{4}{1}\right) + b$

$2 = \frac{20}{8} + b$

$2 = 2.5 + b$

$2 - 2.5 = b$

$-0.5 = b$

Eqn BH $\Rightarrow$ $y = \frac{5}{8}x - 0.5$

$y = y$

$-\frac{8}{5}x - 0.8 = \frac{5}{8}x - 0.5$

$-\frac{8}{5}x - \frac{5}{8}x = -0.5 + 0.8$

$-1.6x - 0.625x = 0.3$

$\frac{-2.225x}{-2.225} = \frac{0.3}{-2.225}$

$x = -0.135$

H (−0.135, ____)

$y = -\frac{8}{5}x - 0.8$

$= -\frac{8}{5}(-0.135) - 0.8$

$= -0.584$

$BH = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(4 + 0.135)^2 + (2 + 0.584)^2}$

$= \sqrt{17.0982 + 6.677} = 4.88u$

$AC = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(-3 - 2)^2 + (4 + 4)^2}$

$= \sqrt{25 + 64} = 9.43u$

Ans: $23u^2$

$A = \frac{B \cdot h}{2} = \frac{(9.43u)(4.88u)}{2}$

Name: Shannon

Quiz: Equivalent Figures

1. The Brown family is considering purchasing a freezer. They learn that there are two equivalent varieties sold at a nearby furniture store. The length of the upright is 90 cm.

   The length of the chest is $1\frac{1}{2}$ times the length of the upright.

   The height of the chest is 4 cm more than twice its width.

   The height of the upright is $2\frac{3}{5}$ times the width of the chest.

   The width of the upright is 44 cm less than the height of the chest.

   How much greater is the width of the upright compared with the width of the chest?

$V_1 = V_2$

$l \cdot w \cdot h = l \cdot w \cdot h$

$(135)(x)(2x+4) = 90(2x-40)(2.6x)$

$135x(2x+4) = 234x(2x-40)$

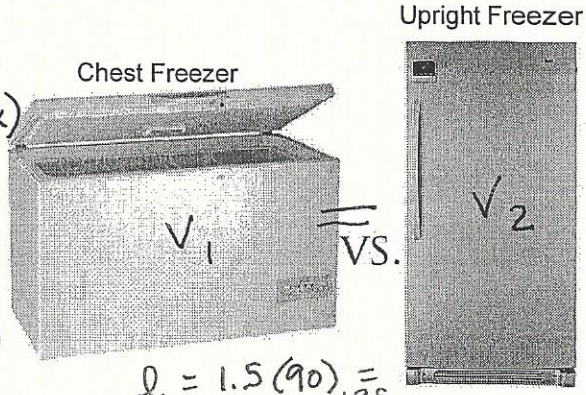
$270x^2 + 540x = 468x^2 - 9360x$

$270x^2 - 468x^2 + 540x + 9360x = 0$

$-198x^2 + 9900x = 0$

$-198x(x-50)$

$x_1 \neq 0 \quad x_2 = 50$



$l = 1.5(90) = 135$

$w = x$

$h = 2x + 4$

$l = 90\text{cm}$

$w = 2x+4-44 = 2x-4$

$h = 2.6(x)$

width of chest $= x = 50$ cm

width of upright $= 2x - 40 = 2(50) - 40$

$= 100 - 40$

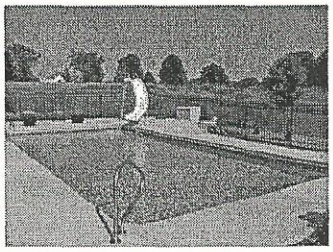
$= 60$ cm

$60\text{ cm} - 50\text{ cm} =$

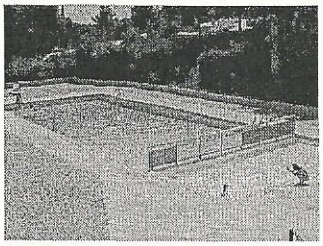
Ans: 10 cm

2. A water park has an adult pool and a baby pool. These pools hold equivalent volumes of water. The baby pool is 50cm deep and the adult pool is four times as deep as the baby pool. The length of the adult pool is 2.5X the width of the baby pool. The baby pool is 4000cm longer than the adult pool. The width of the adult pool is half its length. By how many centimeters does the width of the adult pool exceed the width of the baby pool?

Adult Pool



Baby Pool



Adult Pool

$l = 2.5x$

$w = 1.25x$

$d = 200cm$

Baby Pool

$l = 2.5x + 4000$

$w = x$

$d = 50cm$

$$(200)(2.5x)(1.25x) = (50)(x)(2.5x + 4000)$$

$$625x^2 = 125x^2 + 200000x$$

$$625x^2 - 125x^2 - 200000x = 0$$

$$500x^2 - 200000x = 0$$

$$500x(x - 400) = 0$$

$$x = 400 \Rightarrow \text{width adult pool} = 1.25x$$

$$= (1.25)(400)$$

$$= 500cm$$

width baby pool $= x$

$= 400cm$

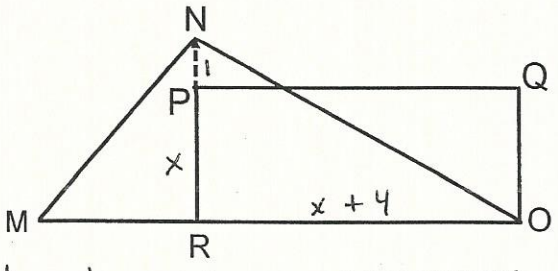
Ans: 100cm

$500cm - 400cm$

$= 100cm$

3. Rectangle PQOR cuts triangle MNO as shown in the figure below:
Side MO is 10cm long.
Side OR is 4cm longer than side PR.
Altitude NR of the triangle, formed by extending side RP, is 1cm longer than side RP.
Triangle MNO and rectangle PQOR are equivalent.

What is the measure, in centimetres, of altitude NR of triangle MNO?
Round off your answer to the nearest hundredth. Clearly show all your work.



triangle

base = 10 cm

$h = x + 1$

rectangle

$l = x + 4$

$w = x$

area triangle = area rectangle

$\frac{1}{2} bh = l \cdot w$

$\frac{1}{2}(10)(x+1) = (x+4)(x)$

$5(x+1) = x^2 + 4x$

$5x + 5 = x^2 + 4x$

$-x^2 + 5x + 5 - 4x = 0$

$-x^2 + x + 5 = 0$

$a = -1$

$b = 1$

$c = 5$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-1 \pm \sqrt{1^2 - 4(-1)(5)}}{2(-1)}$$

$$= \frac{-1 \pm \sqrt{1 + 20}}{-2}$$

$$= \frac{-1 \pm \sqrt{21}}{-2}$$

$$= \frac{-1 \pm 4.5825}{-2}$$

$x_1 = -1.79$ $(x_2 = 2.79)$

$NR = x + 1$

$= 2.79 + 1$

$= 3.79$ cm

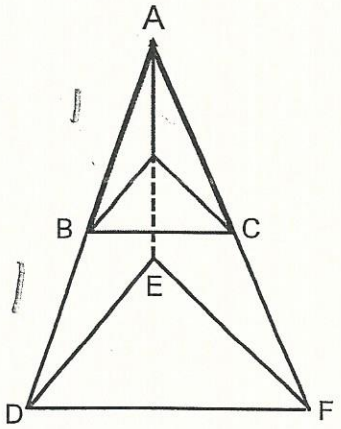
Ans: 3.79cm

Quiz: Ratios of Similarity

Name: Shannon

1. The volume of the smaller pyramid (outlined in purple) below is $16\ cm^3$. Points B and C are the midpoints of sides AD and AF respectively.

What is the volume of the larger pyramid?



$K = 2$

$K^3 = 8$

$8 \cdot 16 = 128$

$K = 2$

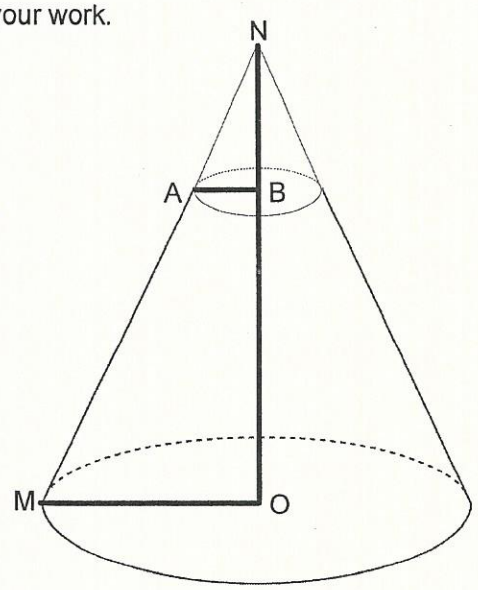
$K^3 = 2^3 = 8$

$8\ (16\ cm^3) =$

Ans: $128\ cm^3$

2. Two cones are created by rotating triangles MNO and ABN. Points A and B divide sides NM and NO each in a ratio of 1:2. The volume of the smaller cone, formed by triangle ABN is 46 cm^3. Determine the volume of the larger cone formed from triangle MNO.

Clearly show all your work.



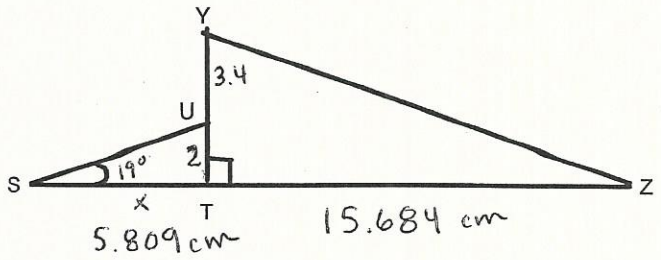
$K = 3$

$K^3 = 3^3 = 27$

$27(46\,cm^3)$

Ans: $1242\,cm^3$

3. A figure is composed of two similar right triangles STU and TYZ.



Side TU measures 2 cm, segment UY measures 3.4 cm, and angle <TSU measures 19°. Calculate the total area of the figure.

Round off your answer to the nearest tenth. Clearly show the steps in the solution and

the geometry principle(s) you used.

$\tan 19° = \frac{2}{x}$

$0.3443 = \frac{2}{x}$

$x = 5.809$

$k = \frac{5.4}{2} = 2.7$

$2.7(5.809) = 15.684\text{ cm}$

Area $\Delta_{STU} = \frac{1}{2}bh$

$= \frac{1}{2}(5.809\text{ cm})(2\text{ cm})$

$= 5.809\text{ cm}^2$

Area $\Delta_{TYZ} = \frac{1}{2}bh$

$= \frac{1}{2}(15.684\text{ cm})(5.4\text{cm})$

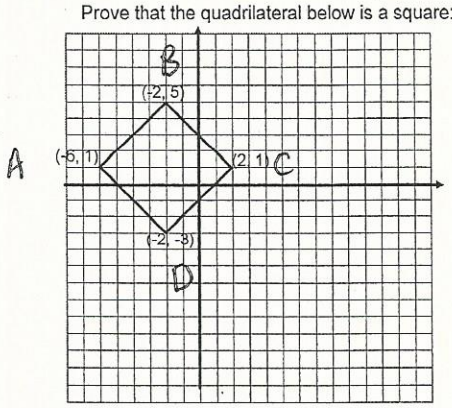
$= 42.35\text{ cm}^2$

$5.809\text{cm}^2 + 42.35\text{cm}^2$

$= 48.1558\text{ cm}^2$

Ans: 48.2 cm^2

Prove that the quadrilateral below is a square:



AB (-6,1), (-2,5)

$m = \frac{5-1}{-2+6} = \frac{4}{4} = 1$

$AB = \sqrt{(-2+6)^2+(5-1)^2}$

$= \sqrt{4^2+4^2}$

$= \sqrt{16+16} = \sqrt{32}$

BC (-2,5), (2,1)

$m = \frac{1-5}{2+2} = \frac{-4}{4} = -1$

$BC = \sqrt{(2+2)^2+(1-5)^2}$

$= \sqrt{4^2+(-4)^2}$

$= \sqrt{16+16}$

$= \sqrt{32}$

CD (2,1) (-2,-3)

$m = \frac{-3-1}{-2-2} = \frac{-4}{-4} = 1$

$CD = \sqrt{(-2-2)^2+(-3-1)^2}$

$= \sqrt{16+16}$

$= \sqrt{32}$

AD (-6,1), (-2,-3)

$m = \frac{-3-1}{-2+6} = \frac{-4}{4} = -1$

$AD = \sqrt{(-2+6)^2+(-3-1)^2}$

$= \sqrt{4^2+4^2} = \sqrt{32}$

This is a square since

① $\overline{AB} = \overline{BC} = \overline{CD} = \overline{AD} = \sqrt{32}$

② $\overline{AB} \parallel \overline{CD}$ since $m_{AB} = m_{CD}$

$\overline{BC} \parallel \overline{AD}$ since $m_{BC} = m_{AD}$

③ $\overline{AB}$ and $\overline{CD}$ are $\perp$ $\overline{BC}$ and $\overline{AD}$ since $m_{AB \text{ or } CD} \cdot m_{BC \text{ or } AD} = -1$

(all angles are 90°)

AB $(-4,0), (2,6)$

$m = \frac{6-0}{2+4} = \frac{6}{6} = 1$

$AB = \sqrt{(2+4)^2 + (6-0)^2}$

$= \sqrt{6^2 + 6^2}$

$= \sqrt{36+36}$

$= \sqrt{72}$

CD $(5,3)\ (-1,-3)$

$m = \frac{-1-5}{-3-3} = \frac{-6}{-6} = 1$

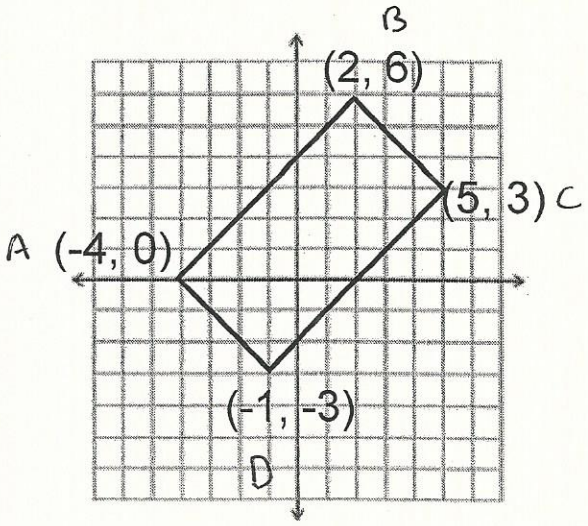
$CD = \sqrt{(-1-5)^2 + (-3-3)^2}$

$= \sqrt{(-6)^2 + (-6)^2}$

$= \sqrt{36+36}$

$= \sqrt{72}$

Prove that the quadrilateral below is a rectangle.



AD $(-4,0), (-1,-3)$

$m = \frac{-1+4}{-3-0} = \frac{3}{-3} = -1$

$AD = \sqrt{(-1+4)^2 + (-3-0)^2}$

$= \sqrt{3^2 + 3^2}$

$= \sqrt{9+9} = \sqrt{18}$

BC $(2,6), (5,3)$

$m = \frac{3-6}{5-2} = \frac{-3}{3} = -1$

$BC = \sqrt{(5-2)^2 + (3-6)^2}$

$= \sqrt{3^2 + 3^2} = \sqrt{18}$

This is a rectangle since:

① $m\overline{AB} = m\overline{CD}$

$m\overline{BC} = m\overline{AD}$

$m\overline{AB}$ (and $\overline{CD}$) $\neq m\overline{BC}$ (and $\overline{AD}$)

② $m_{AB} = m_{CD} \therefore \overline{AB} \parallel \overline{CD}$

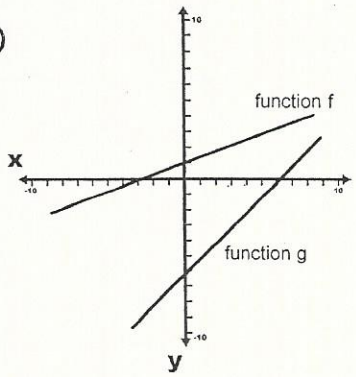
$m_{AD} = m_{BC} \therefore \overline{AD} \parallel \overline{BC}$

$m_{AB} \cdot m_{AD} = -1 \therefore \overline{AB}$ and $\overline{CD}$ are $\perp$ $\overline{AD}$ and $\overline{BC}$

Name: Shannon

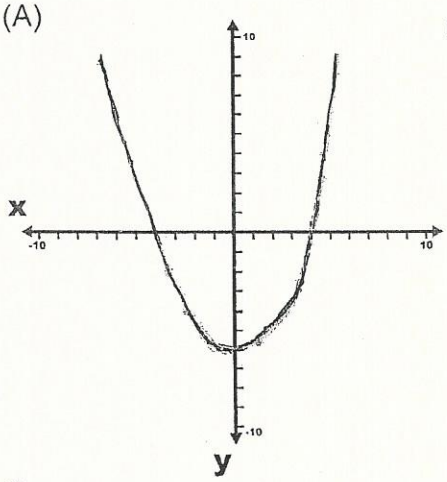
Quiz: Graphs Involving Operations on Functions

1. The following graph represents functions **f** and **g**:

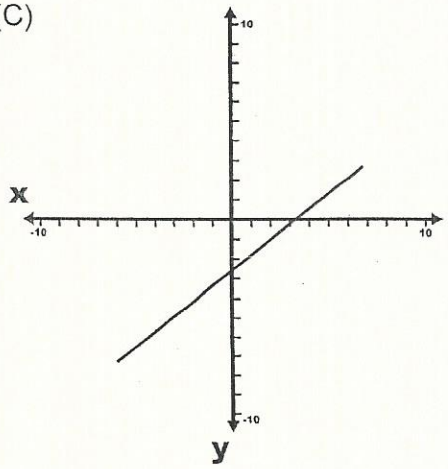


Which one of the following graphs could represent **f • g** ?

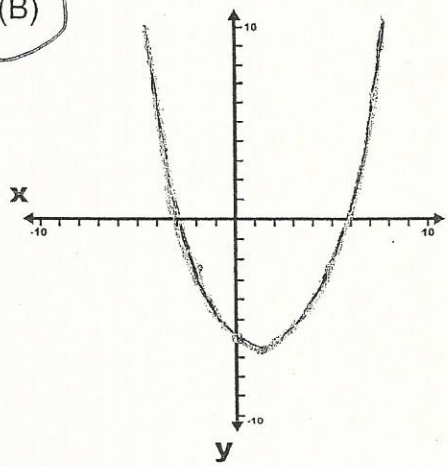
(A)



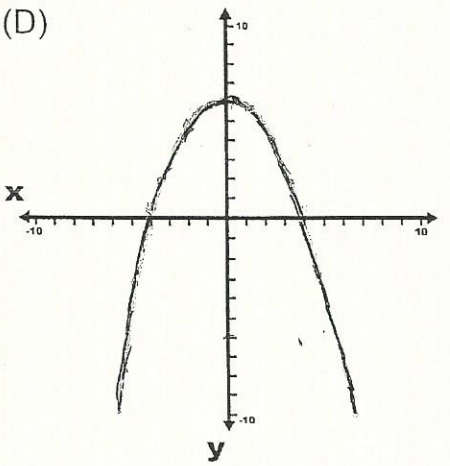
(C)



(B)



(D)



$f \cdot g = \left(\frac{1}{3}x+1\right)(x-6)$

$= \frac{1}{3}x^2 + x - 2x - 6$

$= \frac{1}{3}x^2 - x - 6$

$b = -1$

$b =$

x value = vertex $= \frac{-b}{2a}$

$= \frac{1}{2\left(\frac{1}{3}\right)} = \frac{1}{\frac{2}{3}}$

$= \frac{3}{2} = 1.5$

y-int (b) $= -6$

happy face

f : (0,1) (−3,0)

$m = \frac{0-1}{-3-0} = \frac{-1}{-3} = \frac{1}{3}$

f : $y = \frac{1}{3}x + 1$

g : (6,0) (0,−6)

$m = \frac{-6-0}{0-6} = \frac{-6}{-6} = 1$

g : $y = x - 6$

2. Functions f and g are defined as follows:

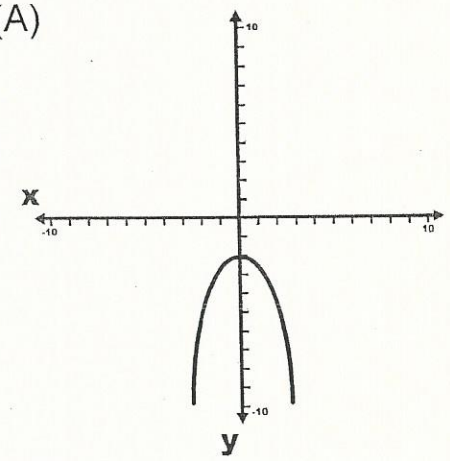
$f(x) = a_1x^2$ where $a_1 > 0$ $\quad y = x^2$

$g(x) = a_2x^2 + c$ where $a_2 = -a_1$ and $c < 0$ $\quad y = -x^2 - c$

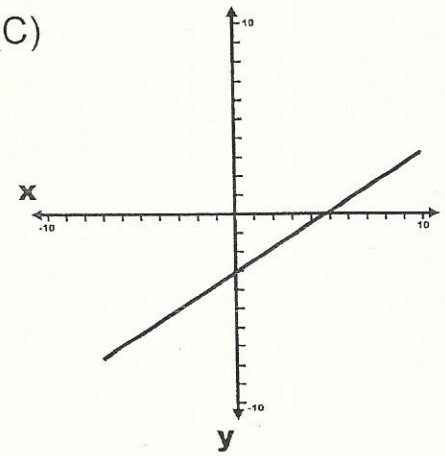
$x^2 - x^2 - c$

Which one of the following graphs could represent f + g ? $\quad y = -c$

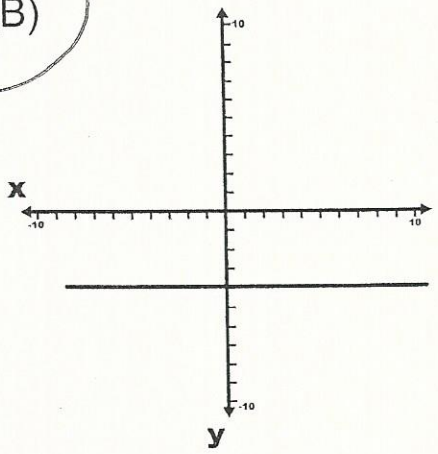
(A)



(C)



(B)



(D)