Apply

10. The point (4, 16) is on the graph of $f(x) = x^2$. Describe what happens to the point when each of the following sets of transformations is performed in the order listed. Identify the corresponding point on the transformed graph.

a) a horizontal translation of 5 units to the left and then a vertical translation of 8 units up

b) a multiplication of the y-values by a factor of $\frac{1}{4}$ and then a reflection in the x-axis

c) a reflection in the x-axis and then a horizontal translation of 10 units to the right

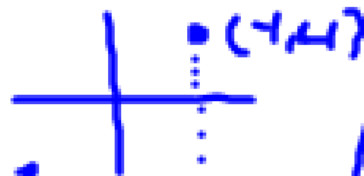
d) a multiplication of the y-values by a factor of 3 and then a vertical translation of 8 units down

#10 pg 158

$(4,16)$

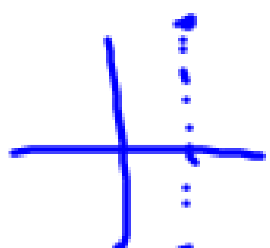
a) $\xleftarrow{5}$ $\uparrow 8$ $\boxed{(-1,24)}$ $(x,y)\to(x-5,\ y+8)$

b) $y \cdot \frac{1}{4}$ $(4,4)$ then R_x



$\boxed{(4,-4)}$

c) $R_x\ (4,16)$



$(4,-16) \xrightarrow{10} \boxed{(14,16)}$

d) $(4,16)$

$\downarrow \times 3$

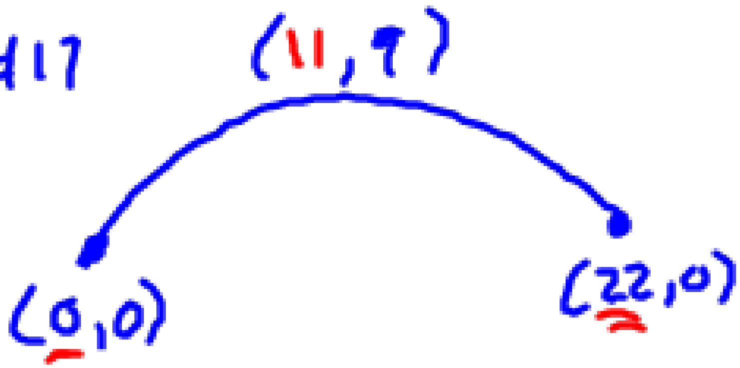
$(4,48)$

$\downarrow 8$

$\boxed{(4,40)}$

17. During a game of tennis, Natalie hits the tennis ball into the air along a parabolic trajectory. Her initial point of contact with the tennis ball is 1 m above the ground. The ball reaches a maximum height of 10 m before falling toward the ground. The ball is again 1 m above the ground when it is 22 m away from where she hit it. Write a quadratic function to represent the trajectory of the tennis ball if the origin is at the spot above the ground from which the ball was hit.

#17



$f(x) = a(x-p)^2 + q$ } vertex (11,10)

$f(x) = a(x-11)^2 + 9$ } using (0,0)

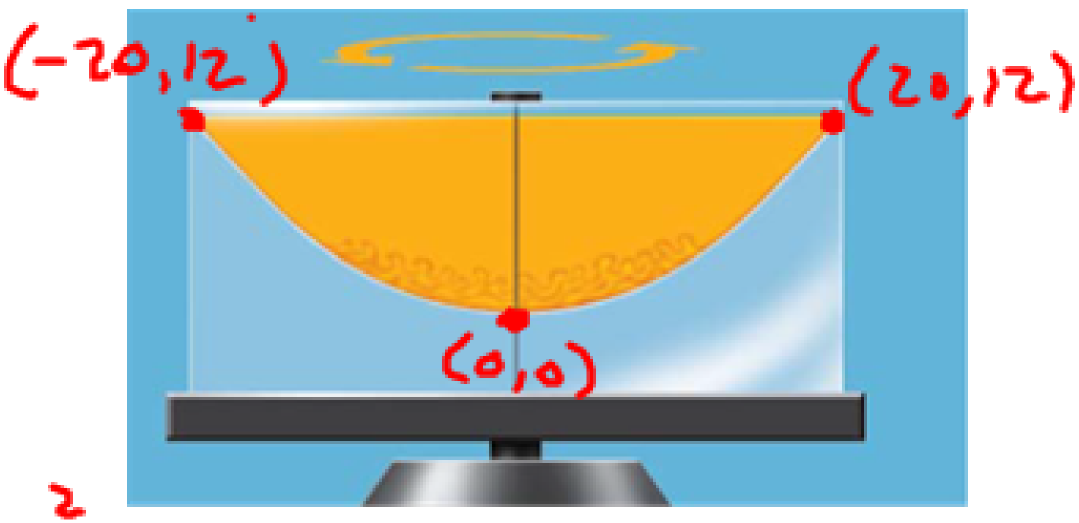
$0 = a(-11)^2 + 9$

$-9 = 121a$

$-\frac{9}{121} = a$

$f(x) = -\frac{9}{121}(x-11)^2 + 9$

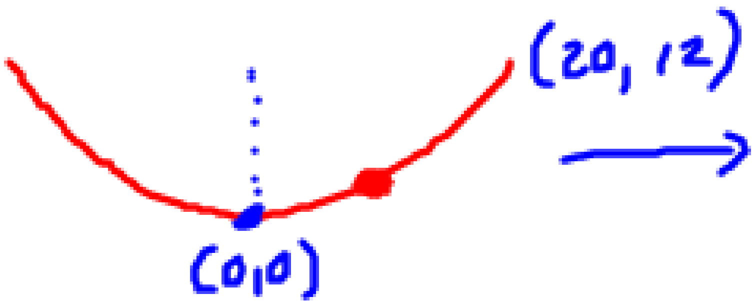
15. When two liquids that do not mix are put together in a container and rotated around a central axis, the surface created between them takes on a parabolic shape as they rotate. Suppose the diameter at the top of such a surface is 40 cm, and the maximum depth of the surface is 12 cm. Choose a location for the origin and write the function that models the cross-sectional shape of the surface.

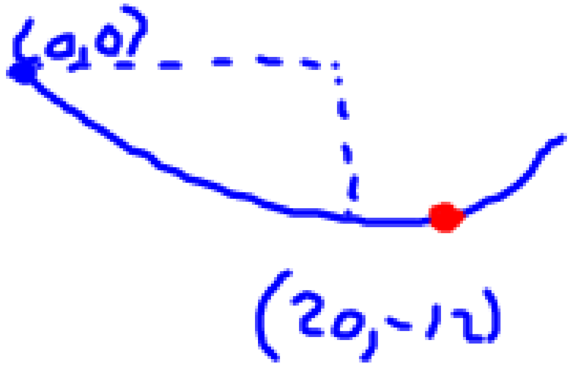


$y = a(x-0)^2 + 0$

$y = ax^2$

#15





$y = a(x-0)^2 + 0$

$y = ax^2$ (20,12)

$12 = a(20)^2$

$12 = 400a$

$\frac{12}{400} = a$

$\frac{3}{100} = a$

$\boxed{y = \frac{3}{100}x^2}$

7 a) $\boxed{y} = -4x^2+14$

vertex $(0, 14)$

concave down

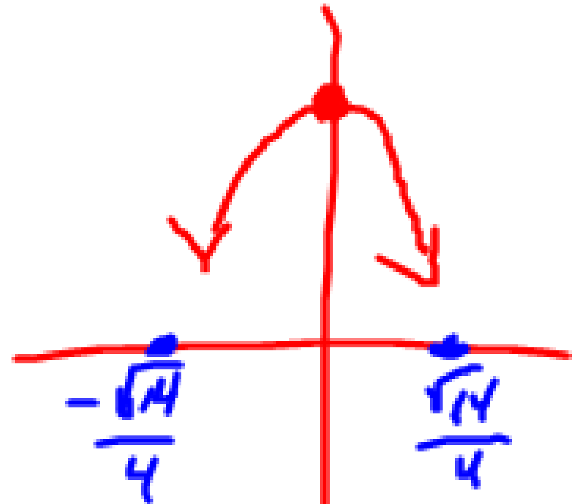
2 x-int

max $y = 14$

axis $x = 0$

domain $x \in R$

range $y \leq 14$



$\boxed{0} = \boxed{-4x^2+14}$

$4x^2 = 14$

$x^2 = \frac{14}{4}$

$x = \pm\sqrt{\frac{14}{4}}$

$\frac{\pm\sqrt{14}}{2}$

3.2 Quadratics : standard form

$$\boxed{y = \underline{a}x^2 + bx + \underline{c}}$$

$y = \underline{a}(x-p)^2 + q$ (V.F.)

vertex (p, q)

$a > 0$ concave up (min)

$a < 0$ concave down (max)

c : y intercept $(0, c)$

vertex : $\boxed{x = -\frac{b}{2a}}$ (sub x to find y)

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

① $f(x) = 2x^2 + 4x + 5$

a) vertex?

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

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

$x = -1$

$y = 2(-1)^2 + 4(-1) + 5$

$y = 2 - 4 + 5$

$y = 3$

$\boxed{(-1, 3)}$

$\boxed{\begin{array}{l} Y_1 = 2x^2 + 4x + 5 \\ \text{calc min} \end{array}}$

b) x intercepts?

$\boxed{\begin{array}{l} Y_1 = 2x^2 + 4x + 5 \\ Y_2 = 0 \\ \text{calc intersect} \end{array}}$

algebraic

$x = \frac{-4 \pm \sqrt{16 - 40}}{4}$

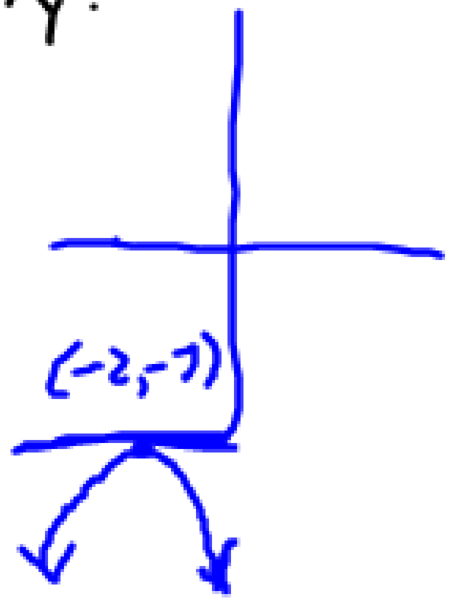
$b^2 - 4ac < 0 \therefore$ none

no x int

② $h(x) = -3(x+2)^2 - 7$

a) axis of symmetry?

axis $\boxed{x = -2}$



b) domain + range?

$x \in \mathbb{R}$ $\quad y \le -7$

$\{y \in \mathbb{R} \mid y \le -7\}$

$(-\infty, -7]$

③ $Y = -2x^2 + 5x + 1$

a) max or min?

$$x = \frac{-5}{-4}$$

$$x = \frac{5}{4}$$

$$Y = -2\left(\frac{5}{4}\right)^2 + 5\left(\frac{5}{4}\right) + 1$$

$$Y = -2\left(\frac{25}{16}\right) + \frac{25}{4} + 1$$

$$= -\frac{50}{16} + \frac{100}{16} + \frac{16}{16}$$

$$= \frac{66}{16} \quad \frac{33}{8}$$

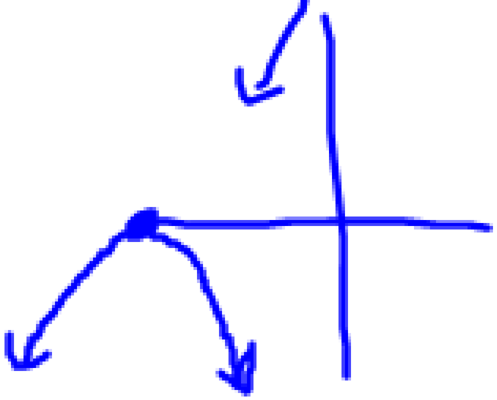
b) Y intercept?

$(0,1)$

4 $f(x) = -2(x+9)^2$

a) vertex?

$\boxed{(-9,0)}$



b) x intercepts?

$\boxed{(-9,0)}$

$$-2(x+9)(x+9)$$

$$-9 \qquad -9$$

5 $f(x) = x^2 + 10$

$\cancel{y = (x-0)^2 + 10}$

a) vertex ?

$(0, 10)$

b) x intercepts?

ϕ

⑥ $y = (x+6)(2x-1)$ $\boxed{y = 2x^2 + 11x - 6}$

a) vertex?

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

$$x = \frac{-11}{4}$$

$$y = 2\left(-\frac{11}{4}\right)^2 + 11\left(\frac{11}{4}\right) - 6$$

$$= \cancel{2}\left(\frac{121}{\cancel{16}}\right) + \frac{121}{4} - 6$$

$$= \frac{121}{8} + \frac{242}{8} - \frac{48}{8}$$

$$y = \frac{315}{8}$$

$$\left(-\frac{11}{4}, \frac{315}{8}\right)$$

b) x intercepts?

$$0 = \boxed{(x+6)(2x-1)}$$

-6 $\quad$ $\frac{1}{2}$

$x+6=0$ $\quad$ $2x-1=0$

$x=-6$ $\quad$ $2x=1$

$x=\frac{1}{2}$

$(-6,0)$ $\left(\frac{1}{2},0\right)$

7 vertex form: $y = -2(x-3)^2 + 7$

VF $(3, 7)$

write in standard form.

$y = ax^2 + bx + c$

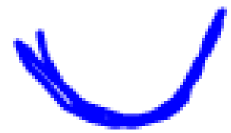
$$y = -2(x-3)^2 + 7$$
$$= -2(x^2 - 6x + 9) + 7$$
$$= -2x^2 + 12x - 18 + 7$$
$$\boxed{y = -2x^2 + 12x - 11}$$

$(x-3)(x-3)$

$x^2 - 6x + 9$

8. Standard form $Y = \frac{1}{2}x^2 + 4x - 2$ S.F.

Write in $\boxed{\text{vertex form}}$



$Y_1 = \frac{1}{2}x^2 + 4x - 2$

calc min

$(-4, -10)$

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

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

$x = -4$

$Y = \frac{1}{2}(-4)^2 + 4(-4) - 2$

$Y = 8 - 16 - 2$

$Y = -10$

$(-4, -10)$

$Y = \frac{1}{2}(x+4)^2 - 10$ V.F.

3.2 Questions 1-19 pgs.174-179

Do the odd numbers (Solutions are posted for all.)