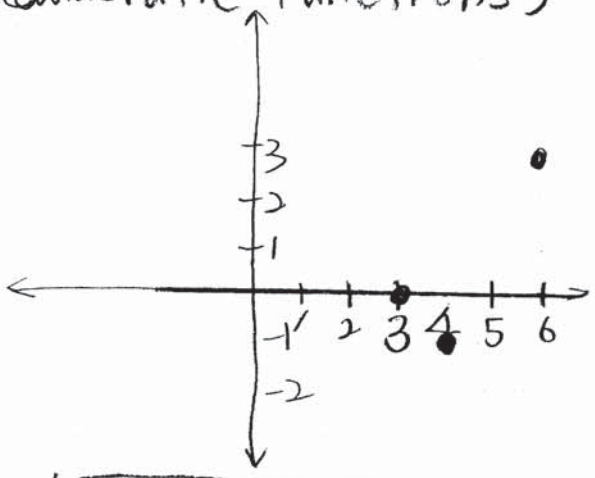
# Unit 2 Test Review (Quadratic Functions)




2) (3,0), (4,-1), (6,3)

$y = ax^2+bx+c$

(3,0)

$0 = a(3)^2+b(3)+c$

$\boxed{0 = 9a+3b+c}$ 1st

$-9a \quad -3b \quad -9a \quad -3b$

$\boxed{-9a-3b = c}$

substitute c

(4,-1)

$-1 = a(4)^2+b(4)+c$

$\boxed{-1 = 16a+4b+c}$ 2nd

substitute c

(6,3)

$3 = a(6)^2+b(6)+c$

$\boxed{3 = 36a+6b+c}$ 3rd

$c = -9a-3b$

2nd equation: $-1 = 16a+4b+c$

$-1 = 16a+4b+(-9a-3b)$

$-1 = 16a+\boxed{4b}\boxed{-9a}\boxed{-3b}$

$-1 = 7a+b$

$-7a-1 = b$

note a=1

$-7(1)-1 = b$

$-7-1 = b$

$-8 = b$

$c = -9a-3b$

3rd equation: $3 = 36a+6b+c$

$3 = 36a+6b+(-9a-3b)$

$3 = 36a+6b-9a-3b$

$\frac{3}{3} = \frac{27a}{3} + \frac{3b}{3}$

$1 = 9a+b$

$-9a+1 = b$

$-9a+1 = -7a-1$

$+7a \quad -1 \quad +7a \quad -1$

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

$a = 1$

2) continued

$\boxed{a = 1}$, $\boxed{b = -8}$, $c = -9a - 3b$

$c = -9(1) - 3(-8)$

$c = -9 + 24$

$\boxed{c = 15}$

$y = ax^2 + bx + c$

$y = 1x^2 - 8x + 15$

$\boxed{y = x^2 - 8x + 15}$

4) $f(x) = -x^2 - 10x - 21$

$f(x) = (-x^2 - 10x) \quad -21$

$f(x) = -(x^2 + 10x \quad ) - 21$

$f(x) = -(x^2 + 10x + 25) - 21 + 25$

Note, actually -25 was added

$\boxed{f(x) = -(x+5)^2 + 4}$

6) $g(x) = -2x^2 + 16x - 32$

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

$16^2 - 4(-2)(-32)$

$256 - 256$

$= 0$

one solution

8) $h(x) = -2(x+5)^2 + 0$

| | | h | k |
|---|---|---|---|
| dilation | | -5 | 0 |

dilation: stretched by factor of -2

horizontal translation: 5 units to the left

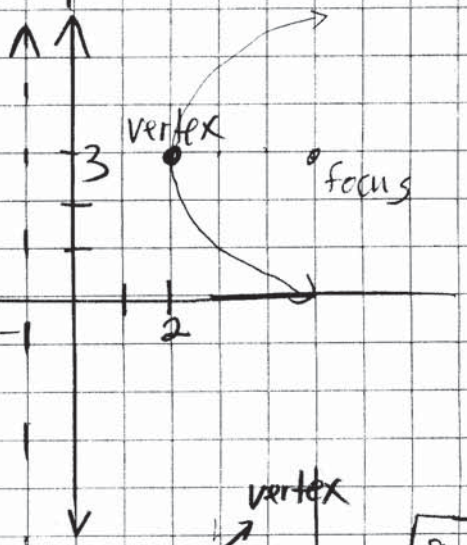
vertical translation: No vertical translation

10) vertex (2,3) and directrix of $x = -1$

$$x = \frac{1}{4p}(y-k)^2 + h$$

$$x = \frac{1}{4(3)}(y-3)^2 + 2$$

$$\boxed{x = \frac{1}{12}(y-3)^2 + 2}$$




12) $f(x) = -x^2 - 5x + 6$

$f(x) = (-x^2 - 5x\quad) + 6$

$f(x) = -(x^2 + 5x\quad) + 6$

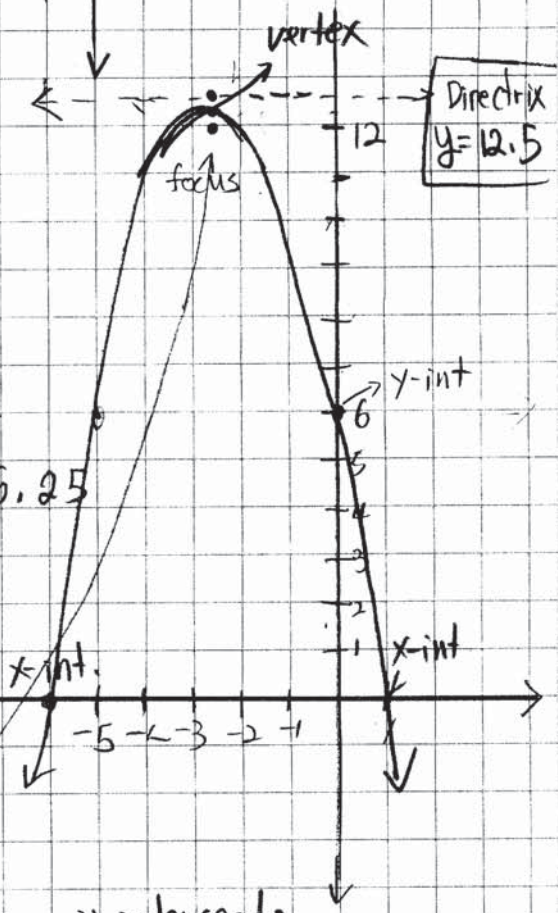
$c = \left(\frac{5}{2}\right)^2$

$f(x) = -(x^2 + 5x + 6.25) + 6 + 6.25$

actually $-6.25$

$f(x) = -(x+2.5)^2 + 12.25$

vertex: $(-2.5, 12.25)$




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

$-4p = 1$

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

$12.25 - 0.25$

focus: $(-2.5, 12)$

y intercept:

$f(0) = -0^2 - 5(0) + 6$

$f(0) = -0 - 0 + 6$

$f(0) = 6$

y intercept is 6 or located at $(0,6)$

x intercept

$0 = -x^2 - 5x + 6$

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

$0 = -(x-1)(x+5)$

$0 = -(x-1)(x+5)$

$x = 1 \quad | \quad x = -5$

x-intercepts are 1 and -5 or located at $(1,0)$ and $(-5,0)$

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

$h$ $k$

vertex: $(-4, -2)$

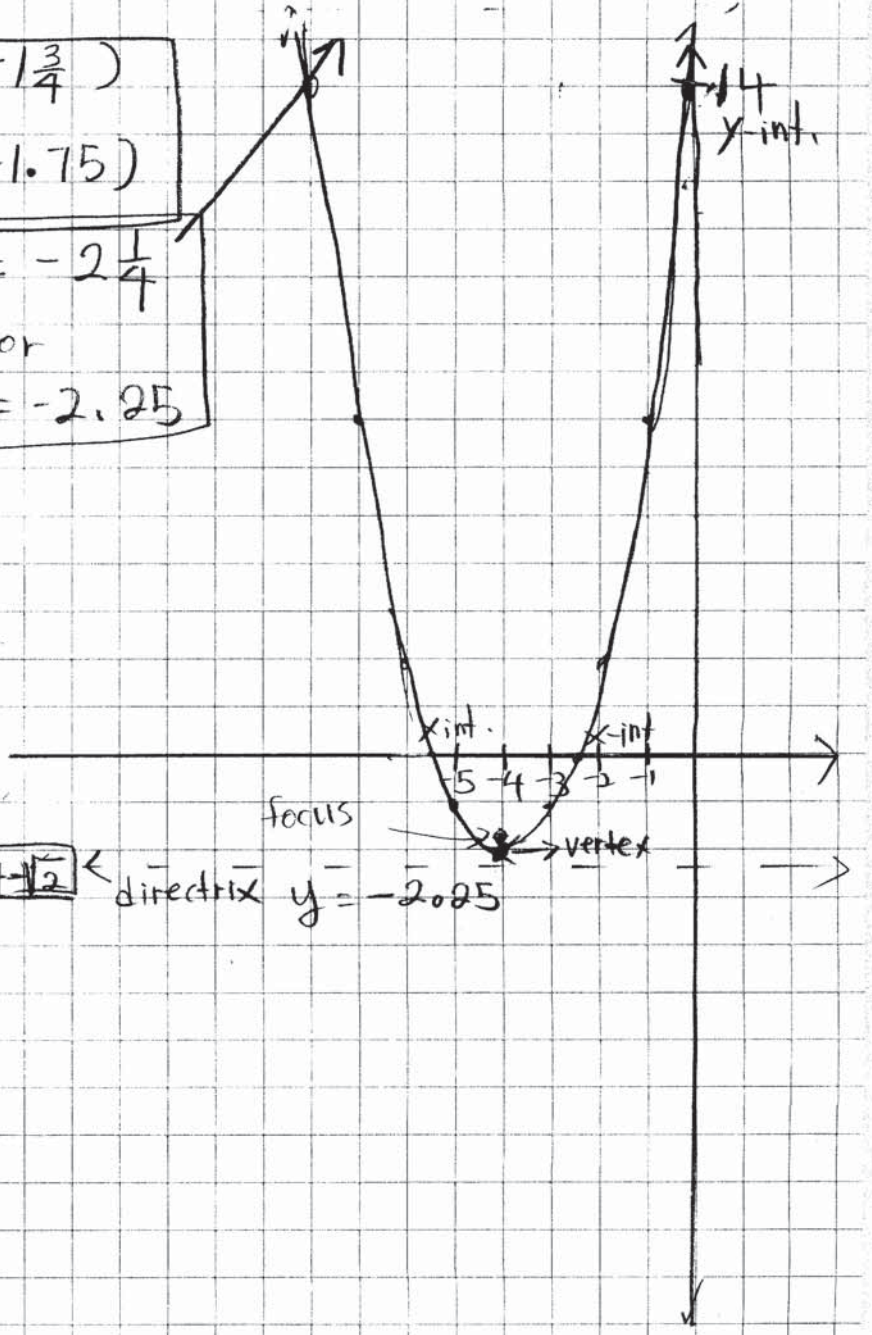
$1 = \frac{1}{4p}$

$4p = 1$

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

focus: $(-4, -1\frac{3}{4})$ or $(-4, -1.75)$

directrix $y = -2\frac{1}{4}$ or $y = -2.25$




y int: 14

$f(0) = (0+4)^2 - 2$

$f(0) = 4^2 - 2$

$= 16 - 2$

$= 14$

x-int: $-4+\sqrt{2}$ and $-4-\sqrt{2}$

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

$+2 \qquad +2$

$2 = (x+4)^2$

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

$\pm\sqrt{2} = x+4$

$-4 \pm \sqrt{2} = x$

$x = -4+\sqrt{2}$ | $x = -4-\sqrt{2}$

$x \approx -4+1.41$ | $x \approx -4-1.41$

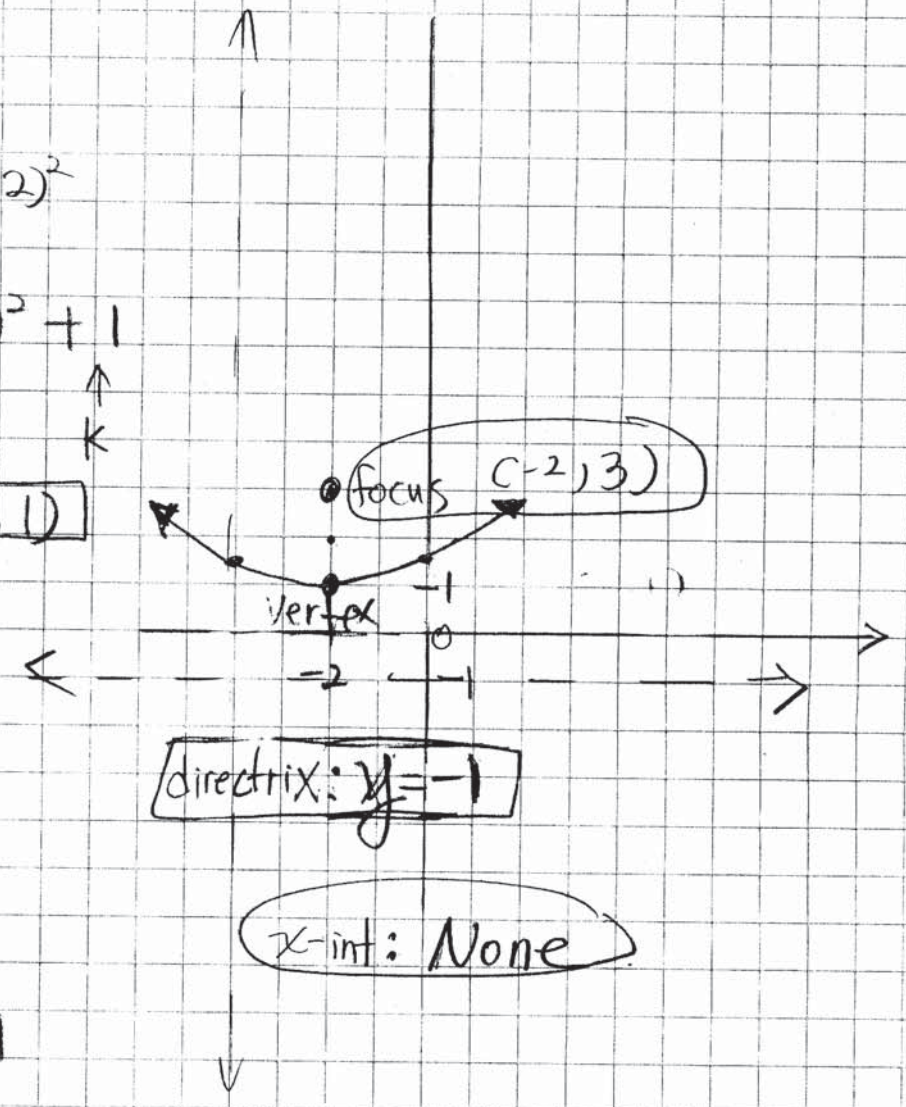
$x \approx -2.59$ | $x \approx -5.41$

16) $y-1 = \frac{1}{8}(x+2)^2$

$y = \frac{1}{8}(x+2)^2 + 1$

$h$ $k$

vertex $(-2, 1)$




$\frac{1}{8} = \frac{1}{4p}$

$4p = 8$

$p = 2$

directrix: $y = -1$

y int.: $1\frac{1}{2}$

x-int: None

$y = \frac{1}{8}(0+2)^2 + 1$

$y = \frac{1}{8}(2)^2 + 1$

$y = \frac{4}{8} + 1$

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

18) $\begin{cases} y = x^2 + 2x \\ y = 2x + 1 \end{cases}$ $\rightarrow$ $y = (x^2 + 2x)$

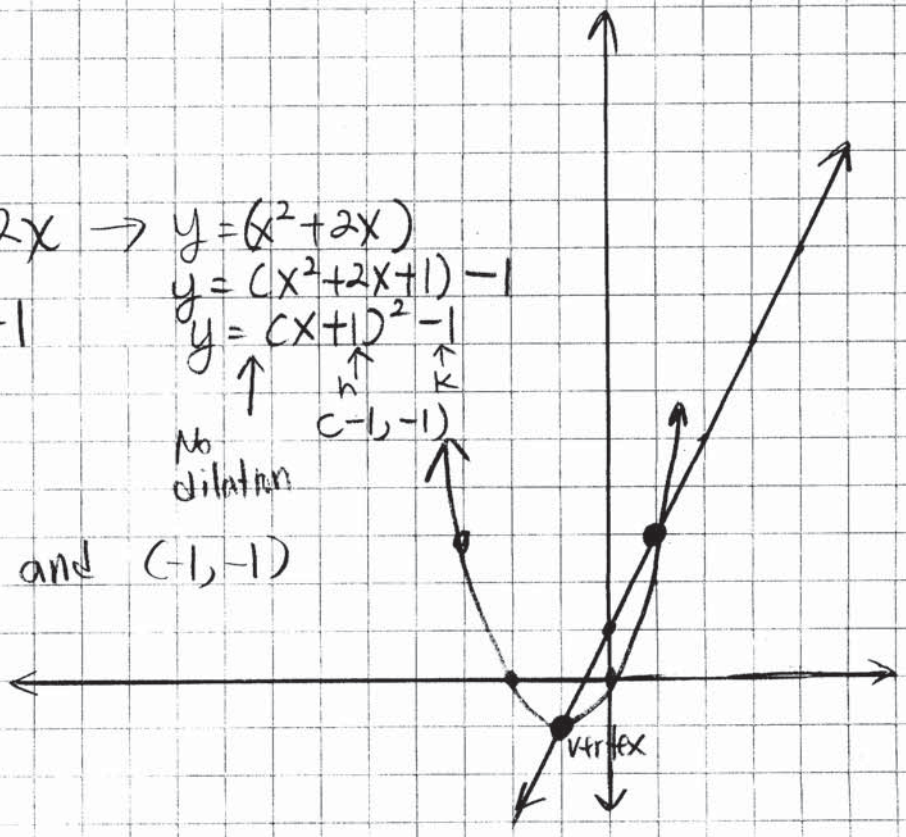
$y = (x^2 + 2x + 1) - 1$

$y = (x+1)^2 - 1$

$h$: $-1$, $k$: $-1$

$(-1, -1)$

No dilation




Solutions: $(1, 3)$ and $(-1, -1)$

20) $y = x^2 + 2x$

$y = 2x + 1$

$x^2 + 2x = 2x + 1$

$-2x \quad -2x$

$x^2 = 1$

$\sqrt{x^2} = \pm\sqrt{1}$

$x = \pm 1$

$x = 1$

$y = 2x + 1$

$y = 2(1) + 1$

$y = 2 + 1$

$y = 3$

$(1, 3)$

$x = -1$

$y = 2x + 1$

$y = 2(-1) + 1$

$y = -2 + 1$

$y = -1$

$(-1, -1)$

21) maximum height will be on axis of symmetry

axis of symmetry : $x = \frac{-b}{2a}$

$x = \frac{-80}{2(-16)}$ → $x = \frac{5}{2}$

$x = 2.5$

2.5 seconds

22) The height will be the y-coordinate of vertex

$h(2.5) = -16(2.5)^2 + 80(2.5)$

$= -16(6.25) + 200$

$= -100 + 200$

$= 100$

maximum height is 100 m

23) $h(3) = -16(3)^2 + 80(3)$

$= -16(9) + 240$

$= -144 + 240$

$= 96$

96 m

24) How many seconds does it take for the ball to hit the ground?

$$0 = -16x^2 + 80x$$

$$0 = -16x(x - 5)$$

$$x = 0 \quad | \quad x = 5$$

5 seconds

25)