

Find the standard equation of any parabola that has vertex V.

1. V(-3,1)
 $y = a(x - (-3))^2 + 1$
 $y = a(x + 3)^2 + 1$

2. V(0,-3)
 $y = a(x - 0)^2 - 3$
 $y = ax^2 - 3$

Express f(x) in the form a(x-h)² + k

3. f(x) = -x² - 4x - 8
 $y + 8 = -(x^2 + 4x)$
 $y + 8 = -(x^2 + 4x + 4)$
 $y + 4 = -(x + 2)^2$
 $y = -(x + 2)^2 - 4$

4. f(x) = 2x² - 12x + 22
 $y + 22 = 2(x^2 - 6x)$
 $y - 22 = 2(x^2 - 6x + 9)$
 $y - 4 = 2(x - 3)^2$
 $y = 2(x - 3)^2 + 4$

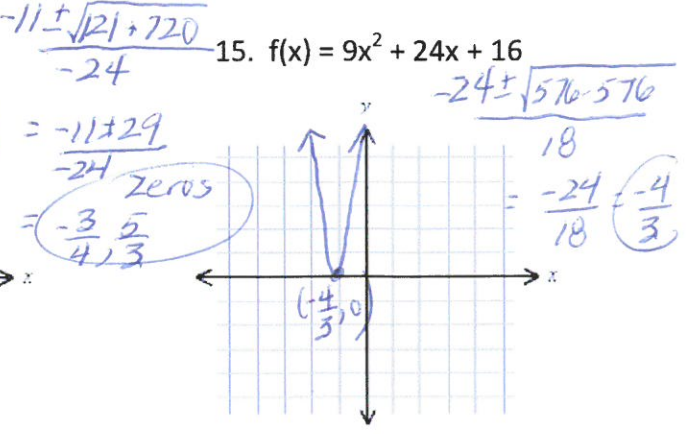
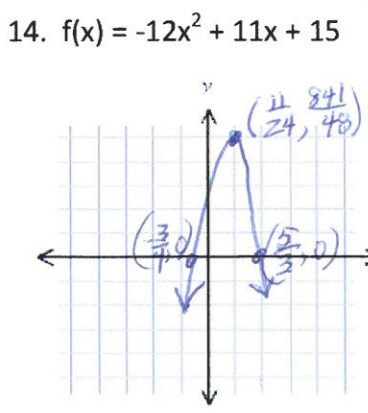
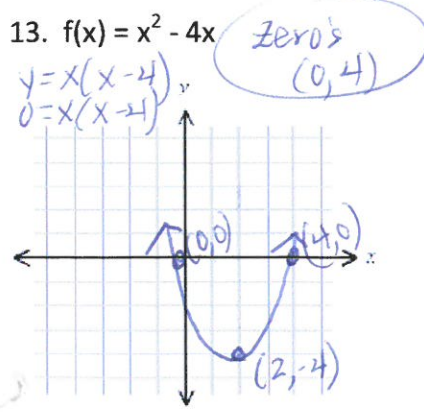
5. f(x) = -3x² - 6x - 5
 $y + 5 = -3(x^2 + 2x + 1)$
 $y + 2 = -3(x + 1)^2$
 $y = -3(x + 1)^2 - 2$

6. f(x) = -4x² + 16x - 13
 $y + 13 = -4(x^2 - 4x + 4)$
 $y - 3 = -4(x - 2)^2$
 $y = -4(x - 2)^2 + 3$

7. f(x) = 5x² + 20x + 17
 $y - 17 = 5(x^2 + 4x + 4)$
 $y + 3 = 5(x + 2)^2$
 $y = 5(x + 2)^2 - 3$

8. f(x) = -3/4x² + 9x - 34
 $y + 34 = -3/4(x^2 - 12x + 36)$
 $y + 7 = -3/4(x - 6)^2$
 $y = -3/4(x - 6)^2 - 7$

Graph to find the zeros of f. Find the minimum or maximum value of f(x).

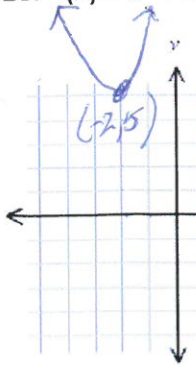


$-\frac{b}{2a} = \frac{-(-4)}{2(1)} = 2$
 $f(2) = -4$ (minimum)

$-\frac{b}{2a} = \frac{-11}{2(-12)} = \frac{11}{24}$
 $f(\frac{11}{24}) = \frac{841}{48} \approx 17.52$ (max)

$-\frac{b}{2a} = \frac{-24}{2(9)} = -\frac{4}{3}$
 $f(-\frac{4}{3}) = 0$ (min)

16. $f(x) = x^2 + 4x + 9$



$$-4 \pm \sqrt{16 - 36}$$

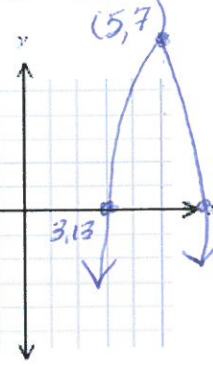
$$\frac{-4 \pm \sqrt{-20}}{2}$$

No x-int.

$$\frac{-b}{2a} = \frac{-4}{2(1)} = -2$$

$$f(-2) = 5 \text{ (min)}$$

17. $f(x) = -2x^2 + 20x - 43$



$$\frac{-20 \pm \sqrt{400 - 344}}{-4}$$

$$= 5 \pm \frac{1}{2}\sqrt{14} \approx 6.87, 3.13$$

$$\frac{6.87 - b}{2a} = \frac{-20}{2(-2)} = 5$$

$$f(5) = 7 \text{ (max)}$$

18. Find the standard equation of the parabola with V(4, -1) and through the point (0, 1)

$$y = a(x - 4)^2 - 1$$

$$1 = a(0 - 4)^2 - 1$$

$$\frac{2}{16} = \frac{16a}{16} \quad a = \frac{1}{8}$$

$$y = \frac{1}{8}(x - 4)^2 - 1$$

19. Find the standard equation of the parabola with V(-2, 4) and through the point (-5, 0).

$$y = a(x + 2)^2 + 4$$

$$0 = a(-5 + 2)^2 + 4$$

$$\frac{-4}{9} = \frac{9a}{9} \quad a = -\frac{4}{9}$$

$$y = -\frac{4}{9}(x + 2)^2 + 4$$

20. Find the standard equation of the parabola with V(3, 5) and x-intercept 0.

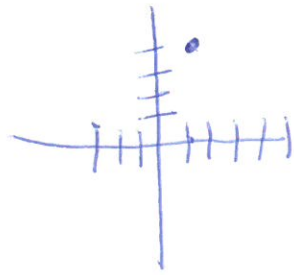
$$y = a(x - 3)^2 + 5$$

$$0 = a(0 - 3)^2 + 5$$

$$\frac{-5}{9} = \frac{9a}{9} \quad a = -\frac{5}{9}$$

$$y = -\frac{5}{9}(x - 3)^2 + 5$$

21. Find the standard equation of the parabola with x-intercepts -3 and 5, highest point has y-coordinate 4.



$$y = a(x - 1)^2 + 4$$

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

$$\frac{-4}{16} = \frac{16a}{16}$$

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

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

22. An object is projected vertically upward from the top of a building with an initial velocity of 144 ft/sec. Its distance $s(t)$ in feet above the ground after t seconds is given by the equation $s(t) = -16t^2 + 144t + 100$.

(a) Find its maximum distance above the ground.

$$424 \text{ ft}$$

(b) Find the height of the building.

$$100 \text{ ft}$$

