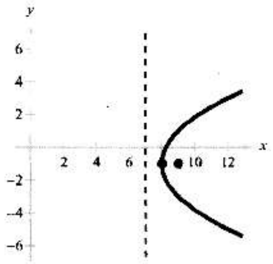
HPC 10.1(b) answers

18. $4x - y^2 - 2y - 33 = 0$

$$y^2 + 2y + 1 = 4x - 33 + 1$$

$$(y + 1)^2 = 4(1)(x - 8)$$

Vertex: $(8, -1)$
Focus: $(9, -1)$
Directrix: $x = 7$

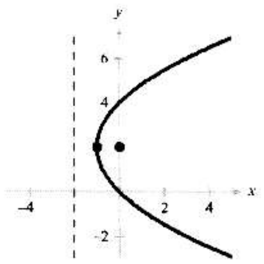


20. $y^2 - 4y - 4x = 0$

$$y^2 - 4y + 4 = 4x + 4$$

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

Vertex: $(-1, 2)$
Focus: $(0, 2)$
Directrix: $x = -2$

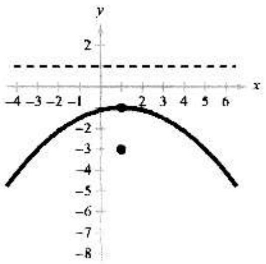


22. $x^2 - 2x + 8y + 9 = 0$

$$x^2 - 2x + 1 = -8y - 9 + 1$$

$$(x - 1)^2 = -8(y + 1) = 4(-2)(y + 1)$$

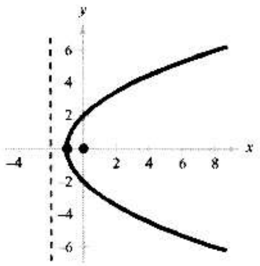
Vertex: $(1, -1)$
Focus: $(1, -3)$
Directrix: $y = 1$



24. $y^2 - 4x - 4 = 0$

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

Vertex: $(-1, 0)$
Focus: $(0, 0)$
Directrix: $x = -2$



26. $y^2 = 9x,\ y \geq 0$

$$y = \sqrt{9x} = 3\sqrt{x}$$

28. Point: $(-2, 6)$

$$x = ay^2$$
$$-2 = a(6)^2$$
$$-\tfrac{1}{18} = a$$
$$x = -\tfrac{1}{18}y^2$$

30. Focus: $(2, 0) \Rightarrow p = 2$

$$y^2 = 4px$$
$$y^2 = 8x$$

32. Focus: $(0, -2) \Rightarrow p = -2$

$$x^2 = 4py$$
$$x^2 = -8y$$

34. Directrix: $y = 3 \Rightarrow p = -3$

$$x^2 = 4py$$
$$x^2 = -12y$$

36. Directrix: $x = -3 \Rightarrow p = 3$

$$y^2 = 4px$$
$$y^2 = 12x$$

38. Vertical axis, passes through $(-3, -3)$

$$x^2 = 4py$$
$$(-3)^2 = 4p(-3)$$
$$9 = -12p \Rightarrow p = -\tfrac{3}{4}$$
$$x^2 = 4\left(-\tfrac{3}{4}\right)y$$
$$x^2 = -3y$$

40. Vertex: $(5, 3) \Rightarrow h = 5,$
$k = 3$

Passes through: $(4.5, 4)$

$(y - k)^2 = 4p(x - h)$

$(y - 3)^2 = 4p(x - 5)$

$1 = 4p(4.5 - 5)$

$p = -\frac{1}{2}$

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

42. Vertex: $(3, -3) \Rightarrow h = 3,$
$k = -3$

Passes through: $(0, 0)$

$(x - h)^2 = 4p(y - k)$

$(x - 3)^3 = 4p(y + 3)$

$9 = 12p$

$p = \frac{3}{4}$

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

44. Vertex: $(-1, 2) \Rightarrow h = -1, k = 2$

Focus: $(-1, 0) \Rightarrow p = -2$

$(x - h)^2 = 4p(y - k)$

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

$(x + 1)^2 = -8(y - 2)$

46. Vertex: $(-2, 1) \Rightarrow h = -2, k = 1$

Directrix: $x = 1 \Rightarrow p = -3$

$(y - k)^2 = 4p(x - h)$

$(y - 1)^2 = 4(-3)(x - (-2))$

$(y - 1)^2 = -12(x + 2)$

48. Focus: $(0, 0)$; Directrix: $y = 8 \Rightarrow p = -4$

$h = 0, k = 4$

$(x - h)^2 = 4p(y - k)$

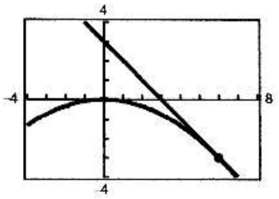
$x^2 = 4(-4)(y - 4)$

$x^2 = -16(y - 4)$

50. $x^2 + 12y = 0 \Rightarrow y_1 = -\frac{1}{12}x^2$

$x + y - 3 = 0 \Rightarrow y_2 = 3 - x$

Using the trace or intersect feature, the point of tangency is $(6, -3)$.



52. $2y = x^2$

$4\left(\frac{1}{2}\right)y = x^2$

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

Focus: $\left(0, \frac{1}{2}\right)$

$d_1 = \frac{1}{2} - b$

$d_2 = \sqrt{(-3 - 0)^2 + \left(\frac{9}{2} - \frac{1}{2}\right)^2} = 5$

$\frac{1}{2} - b = 5$

$b = -\frac{9}{2}$

$m = \frac{-(9/2) - (9/2)}{0 + 3} = -3$

Tangent line: $y = -3x - \frac{9}{2} \Rightarrow 6x + 2y + 9 = 0$

x-intercept: $\left(-\frac{3}{2}, 0\right)$

54. $y = -2x^2, (2, -8)$

$x^2 = -\frac{1}{2}y = 4\left(-\frac{1}{8}\right)y \Rightarrow p = -\frac{1}{8}$. Focus: $\left(0, -\frac{1}{8}\right)$

$d_1 = \frac{1}{8} + b$

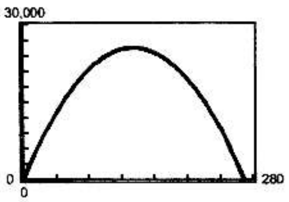
$d_2 = \sqrt{(2 - 0)^2 + \left(-8 + \frac{1}{8}\right)^2} = \frac{65}{8}$

$d_1 = d_2 \Rightarrow \frac{1}{8} + b = \frac{65}{8} \Rightarrow b = 8$

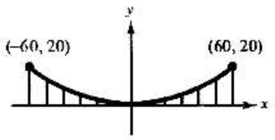
$m = \frac{-8 - 8}{2 - 0} = -8$

$y = -8x + 8$

Intercept: $(1, 0)$

56. 

$R = 378x - \frac{7}{5}x^2$ is a maximum (25, 515) at $x = 135$ units.

58. (a) 

(b) $(x - 0)^2 = 4p(y - 0)$

$x^2 = 4py$

At (60, 20): $60^2 = 4p(20) \Rightarrow p = 45$

$x^2 = 4(45)y$

$y = \dfrac{x^2}{180}$

(c)

x	0	20	40	60
y	0	$2\frac{2}{9}$	$8\frac{8}{9}$	20

60. Vertex: (0, 0)

$y^2 = 4px$

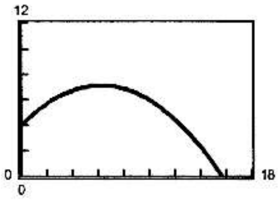
Point: (1000, 800)

$800^2 = 4p(1000) \Rightarrow p = 160$

$y^2 = 4(160)x$

$y^2 = 640x$

62. $y = -0.08x^2 + x + 4$

(a) 

(b) The highest point is approximately (6.25, 7.125). The range is approximately 15.69 feet.

64. $y = -\dfrac{16}{v^2}x^2 + s$

550 miles per hour = 806.67 feet per second.

$y = -\dfrac{16}{806.67^2}x^2 + 42{,}000$

$y = 0 \Rightarrow \dfrac{16}{806.67^2}x^2 = 42{,}000$

$x^2 \approx 1{,}708{,}115{,}666.67 \Rightarrow x \approx 41{,}329.37$ feet

66. True

68. $\pm 10, \pm 5, \pm 2, \pm 1, \pm\frac{5}{2}, \pm\frac{1}{2}$

70. $\pm 22, \pm 11, \pm 2, \pm 1, \pm\frac{22}{3}, \pm\frac{11}{3}, \pm\frac{2}{3}, \pm\frac{1}{3}$