$mx+b$

1. $f(x) = 5x + 3$, $m = 5$ ✓

3. $f(x) = -2x + 1$, $m = -2$ ✓

$mx+b$

5. $f(x) = 5x + 3 \rightarrow$ 0 ✗

7. $f(x) = -2x + 1 \rightarrow$ 0 ✗

$y - y_1 = m(x - x_1)$

$y = mx + b$

$m = \frac{y_2 - y_1}{x_2 - y_1}$

9. $(0, -1)$ and $(1, 4)$

$$m = \frac{4 + (+1)}{1 + 0}$$

$$= \frac{5}{1}$$

$$= 5$$

$m = 5$

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

$$y + 1 = 5x - 0$$

$$-1 \qquad -1$$

$$y = 5x - 1$$

$b = -1 \quad (0, -1)$

11. $(-2, -3)$ and $(-1, -2)$

$$m = \frac{(-2) + (+3)}{(-1) + (+2)}$$

$$= \frac{1}{1}$$

$$= 1$$

$m = 1$

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

$$y + 3 = x + 2$$

$$-3 \qquad -3$$

$$y = x - 1$$

$b = -1 \quad (0, -1)$

13. $y = 2x + 4$; $(1, a)$ $y = a$

$y = 2(1) + 4$

$y = 2 + 4$

$y = 6$ $a = 6$

15. $y = 3x - 1$; $(a, 2)$ $x = a$

$2 = 3x - 1$

$+1 \quad +1$

$\frac{3}{3} = \frac{3x}{3}$

$1 = x$

$x = 1$ $a = 1$

17. $y = x^2 - 1$; $(1, a)$ $y = a$

$y = (1)^2 - 1$

$y = 1 - 1$

$y = 0$

$a = 0$

19. $y = 4x + b$; $(1, -1)$

$-1 = 4(1) + b$

$-1 = 4 + b$

$-4 \quad -4$

$-5 = b$

$b = -5$

21. $y = -2x + b$; $(2, 3)$

$3 = -2(2) + b$

$3 = -4 + b$

$+4 \quad +4$

$7 = b$

$b = 7$

23. $y = 2x^2 + bx + 3$; $(2, 7)$

$7 = 2(2)^2 + b(2) + 3$

$7 = 2(4) + 2b + 3$

$7 = 8 + 2b + 3$

$7 = 2b + 11$

$-11 \quad -11$

$-4 = 2b$

$\frac{-4}{2} = \frac{2b}{2}$

$-2 = b$

$b = -2$

Check

$7 = 2(2)^2 + (-2)(2) + 3$

$2 \cdot 4 - 4 + 3$

$8 - 1$

$7 = 7$

25. $y = -2x^2 + bx + 4$; $(4, -16)$

$-16 = -2(4)^2 + b(4) + 4$

$-16 = -2(16) + 4b + 4$

$-16 = -32 + 4b + 4$

$-16 = 4b - 28$

$+28 \quad +28$

$\frac{12}{4} = \frac{4b}{4}$

$3 = b$

$b = 3$

27. $y = -\frac{2}{3}x - 4$

D: $(-\infty, \infty)$

R: $y = -\frac{2}{3}x - 4$

$+4 \qquad +4$

$=$

$y + 4 = -\frac{2}{3}x$

$\left(\frac{3}{2}\right) \quad y + 4 = \left(\frac{3}{-2}\right)\left(-\frac{2}{3}\right)x$

$=$

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

R: $(-\infty, \infty)$

29. $y = (x-3)^2 - 2$

$=$

$y = x^2 - 6x + 7$

Domain: $(-\infty, \infty)$

Range: $y = (x-3)^2 - 2$

$+2 \qquad +2$

$=$

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

$=$

$\sqrt{y+2} = x - 3$

$+3 \qquad +3$

$=$

$\sqrt{y+2} + 3 = x$

$y \geq -2$

$[-2, \infty)$

31. $y = (x+1)^3 - 1$

Domain : $(-\infty, \infty)$

Range : $y = (x+1)^3 - 1$

$+1 \qquad +1$

$\sqrt[3]{y+1} = \sqrt[3]{(x+1)^3}$

$\sqrt[3]{y+1} = x+1$

$-1 \qquad -1$

$\sqrt[3]{y+1} - 1 = x$

$(-\infty, \infty)$

33. $y = \sqrt{x-1}$

Domain: $x - 1 \geq 0$

$+1 \qquad +1$

$x \geq 1$

$[1, \infty)$

Range :

$[0, \infty)$

$(y)^2 = (\sqrt{x-1})^2$

$y^2 = x - 1$

$+1 \qquad +1$

$y^2 + 1 = x$ ← Determine Domain Restriction

$y^2 + 1 \geq 1$

$-1 \quad -1$

$\sqrt{y^2} \geq \sqrt{0}$

$y \geq 0$

$[0, \infty)$

35. $y = \frac{1}{x-2}$

$x - 2 = 0$

$+2 \quad +2$

$x = 2$

D: $(-\infty, 2) \cup (2, \infty)$

Range!

$(x-2)\, y = \frac{1}{x-2}\,(x-2)$

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

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

$+2 \quad +2$

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

R: $(-\infty, 0) \cup (0, \infty)$

$x = 2$ vertical asymptote

$y = 0$ horizontal asymptote

37. $y = x^2 + 5x + 6$

$ax^2 + bx + c$

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

$a = 1$

$b = 5$

$x = \frac{-(5)}{2(1)}$

$x = \frac{-5}{2} = -2.5$

$y = (-2.5)^2 + 5(-2.5) + 6$

$y = -.25$

39. $y = -4x^2 + 24x - 30$

$x = \frac{-b}{2a}$ $\quad ax^2 + bx + c$

$a = -4$

$b = 24$

$x = \frac{-(24)}{2(-4)}$

$x = \frac{-24}{-8}$

$x = 3$

$y = -4(3)^2 + 24(3) - 30$

$y = 6$

41. $y = 6x^2 - 13x - 28$

$a = 6$

$b = -13$

$x = \frac{-(-13)}{2(6)}$

$x = \frac{13}{12}$

$x = 1.08\overline{3}$

$y = 6(1.08\overline{3})^2 - 13(1.08\overline{3}) - 28$

$y = -35.0417$

43. $y = -15x^2 - 34x + 16$ $\quad x = \frac{-b}{2a}$

$a = -15$

$b = -34$

$x = \frac{-(-34)}{2(-15)}$

$x = \frac{34}{-30}$

$x = -1.1\overline{3}$

$y = -15(-1.1\overline{3})^2 - 34(-1.1\overline{3}) + 16$

$y = 35.2665$

45. 2 ✓

47. 3 ✓

49. 4 ✓

51. 5 ✓

53. $f(x) = 4x + 5$

D: $(-\infty, \infty)$

R: $y = 4x + 5$

$-5 \qquad -5$

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

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

$(-\infty, \infty)$ ✓

55. $f(x) = -2x - 3$

D: $(-\infty, \infty)$ ✓

R: $y = -2x - 3$

$+3 \qquad +3$

$\frac{y+3}{-2} = \frac{-2x}{-2}$

$\frac{y+3}{-2} = x$

$(-\infty, \infty)$

57. $f(x) = \frac{1}{5x+15}$

D:

$5x + 15 = 0$

$-15 \quad -15$

$\frac{5x}{5} = \frac{-15}{5}$

$x = -3$

$(-\infty, -3) \cup (-3, \infty)$

R: $y = \frac{1}{5x+15}$

$(5x+15)\ y = \frac{1}{5x+15}\ ,\ \frac{5x+15}{1}$

$\frac{y(5x+15)}{y} = \frac{1}{y}$

$5x + 15 = \frac{1}{y}$

$\frac{5(x+3)}{5} = \frac{\frac{1}{y}}{5}$

$x + 3 = \frac{1}{y} \div 5$

$-3 \quad -3$

$x = \left(\frac{1}{y} \cdot \frac{5}{1}\right) - 3$

$x = \frac{5}{y} - 3$

$(-\infty, 0) \cup (0, \infty)$

59. $y = \frac{1}{6x-30}$

D: $6x - 30 = 0$

$+30 \quad +30$

$\frac{6x}{6} = \frac{30}{6}$

$x = 5$

$(-\infty, 5) \cup (5, \infty)$

R: $(6x-30)\, y = \frac{1}{6x-30}(6x-30)$

$\frac{y(6x-30)}{y} = \frac{1}{y}$

$6x - 30 = \frac{1}{y}$

$\frac{6(x-5)}{6} = \frac{1}{y} \div 6$

$x - 5 = \frac{1}{y} \cdot \frac{1}{6}$

$x - 5 = \frac{1}{6y} + 5$

$+5$

$x = \frac{1}{6y} + 5$

$(-\infty, 0) \cup (0, \infty)$

61. $f(x) = \sqrt{5x + 15}$

D: $5x + 15 \geq 0$

$-15 \quad -15$

$\frac{5x}{5} \geq \frac{-15}{5}$

$x \geq -3$

$[-3, \infty)$

R: $(y)^2 = \left(\sqrt{5x+15}\right)^2$

$y^2 = 5x + 15$

$-15 \quad -15$

$\frac{y^2 - 15}{5} = \frac{5x}{5}$

$\frac{y^2 - 15}{5} = x$

$(5)\ \frac{y^2 - 15}{5} \geq -3\,(5)$

$y^2 - 15 \geq -15$

$+15 \quad +15$

$\sqrt{y^2} \geq \sqrt{0}$

$y \geq 0$

R: $[0, \infty)$

63. $f(x) = \sqrt{6x-30}$

D:

$$6x-30 \geq 0$$
$$+30 \quad +30$$
$$\frac{6x}{6} \geq \frac{30}{6}$$
$$x \geq 5$$
$$[5, \infty)$$

R: $(y)^2 = \left(\sqrt{6x-30}\right)^2$

$$y^2 = 6x-30$$
$$+30 \qquad +30$$
$$\frac{y^2+30}{6} = \frac{6x}{6}$$
$$\frac{y^2+30}{6} = x$$
$$(6)\ \frac{y^2+30}{6} \geq 5(6)$$
$$y^2+30 \geq 30$$
$$-30 \quad -30$$
$$\sqrt{y^2} \geq \sqrt{0}$$
$$y \geq 0$$
$$[0, \infty)$$

65. $f(x) = \frac{1}{\sqrt{5x+15}}$

D: $5x + 15 > 0$

$-15 \quad -15$

$\frac{5x}{5} > \frac{-15}{5}$

$x > -3$

$(-3, \infty)$

R: $y = \frac{1}{\sqrt{5x+15}}$

$y\sqrt{5x+15} = 1$

$\frac{y\sqrt{5x+15}}{y} = \frac{1}{y}$

$\left(\sqrt{5x+15}\right)^2 = \left(\frac{1}{y}\right)^2$

$5x + 15 = \frac{1}{y^2}$

$-15 \quad -15$

$\frac{5x}{5} = \frac{\frac{1}{y^2} - 15}{5}$

$x = \left(\frac{1}{y^2} - 15\right) \div 5$

$\frac{\frac{1}{y^2} - 15}{+15} > \frac{0}{+15}$

$\frac{1}{y^2} > 15$

$\sqrt{\frac{1}{y^2}} > \sqrt{15}$

$(0, \infty)$

$-3 > \left(\frac{1}{y^2} - 15\right) \div 5 \frac{1}{5}$

$(5)-3 > \left(\frac{1}{y^2} - 15\right)\frac{1}{5}(5)$

$-15 > \frac{1}{y^2} - 15$

$+\frac{1}{y^2} \qquad +\frac{1}{y^2}$

$(-\infty, 0) \cup (0, \infty)$

69. $f(x) = \sqrt[3]{20x-4}$ D: $(-\infty, \infty)$

R: $(y)^3 = \left(\sqrt[3]{20x-4}\right)^3$

$y^3 = 20x - 4$

$\frac{y^3}{4} = \frac{4(5x-1)}{4}$

$\frac{y^3}{4} = 5x + 1$

$-1 \quad -1$

$\frac{y^3}{4} - 1 = \frac{5x}{5}$

$\left(\frac{y^3}{4} - 1\right) \div 5 = x$

$(-\infty, \infty)$

$(20x-4)^{1/3}$

71. $f(x) = \sqrt[4]{4x+8}$

$= (4x+8)^{1/4}$

D: $4x + 8 \geq 0$

$-8 \quad -8$

$\frac{4x}{4} \geq \frac{-8}{4}$

$x \geq -2$

$[-2, \infty)$

R: $(y)^4 = \left(\sqrt[4]{4x+8}\right)^4$

$= y^4 = 4x + 8$

$-8 \qquad -8$

$\frac{y^4 - 8}{4} = \frac{4x}{4}$

$= \frac{y^4 - 8}{4} = x$

$= \sqrt[4]{\frac{y^4 - 8}{4}} \geq \sqrt[4]{-2}$

$[0, \infty)$

73. $f(x) = \frac{1}{\sqrt[3]{20x-4}}$

D: $20x - 4 \geq 0$

$+4 \quad +4$

$\frac{20x}{20} = \frac{4}{20}$

$x \geq \frac{1}{5}$

$x \geq .2$

$(-\infty, .2) \cup (.2, \infty)$

$y = \frac{1}{\sqrt[3]{20x-4}}$

$y^3 = \frac{1}{20x-4}$ $(20x-4)$

$\frac{y^3(20x-4)}{y^3} = \frac{1}{y^3}$

$20x - 4 = \frac{1}{y^3}$

$+4 \quad +4$

$\frac{20x}{20} = \frac{\frac{1}{y^3} + 4}{20}$

$x = \left(\frac{1}{y^3} + 4\right) \div 20$

$.2 > \frac{1}{y^3} + 4 \div 20$

$\sqrt[3]{.2} > \sqrt[3]{\frac{1}{y^3}}$ $\sqrt[3]{4} \div \sqrt[3]{20}$

$\sqrt[3]{y^3}$

$(-\infty, 0) \cup (0, \infty)$