**Transforming and Analyzing Linear Functions**

**For questions 1-8, describe the transformation of the linear parent function, f(x) = x, that will result in the graph of the linear function given.**

2. g(x) = -2(x) + 5

*ANSWER*:

a is negative, so the graph is reflected over the x-axis

|2| > 1, so the graph is vertically stretched by a factor of 2

d = 5, so the graph will translate 5 units up

4. g(x) = (- $\frac{1}{2}$x + 3) + 7

*ANSWER*:

g(x) = (- $\frac{1}{2}$x – (-3)) + 7

b is negative, so the graph is reflected over the y-axis

b = - $\frac{1}{2}$, so the graph is horizontally stretched by a factor of $\frac{1}{|\frac{1}{2}|}$ = 2

c = -3, so the graph will translate |$\frac{3}{\frac{1}{2}}$| = 6 to the left

d = 7, so the graph will translate 7 units up

6. g(x) = $\frac{2}{3}$(6x + 1) – 3

*ANSWER*:

g(x) = $\frac{2}{3}$(6x – (-1)) – 3

 a = $\frac{2}{3}$; 0 < $\frac{2}{3}$ < 1, so the graph is vertically compressed by a factor of $\frac{2}{3}$

b = 6, so the graph is horizontally compressed by a factor of $\frac{1}{|6|}$ = $\frac{1}{6}$

c = -1, so the graph will translate |$\frac{1}{6}$| = $\frac{1}{6}$ to the left

d = -3, so the graph will translate 3 units down

8. g(x) = -(-8x + 9) – 6

*ANSWER*:

g(x) -(-8x – (-9)) – 6

a is negative, so the graph is reflected over the x-axis

b is negative, so the graph is reflected over the y-axis

b = -8, so the graph is horizontally compressed by a factor of $\frac{1}{|-8|}$ = $\frac{1}{8}$

c = -9, so the graph will translate |$\frac{-9}{8}$| = $\frac{9}{8}$ to the left

d = -6, so the graph will translate 6 units down

**For questions 9-12, identify the domain, range, x-intercept, and y-intercept of the linear function described by the equation and the graph. Write the domain and range as inequalities.**

10.



*SOLUTION:*

Since this is a linear function, the domain and range are both *all real numbers.*

a = -$\frac{1}{3}$, b = 1, c = 6, and d = -7

The x-intercept is ($\frac{ac-d}{ab}$, 0); ($\frac{-\frac{1}{3}\*6+7}{-\frac{1}{3}\*1}$, 0) = ($\frac{-2+7}{-\frac{1}{3}}$, 0) = ($\frac{5}{-\frac{1}{3}}$, 0) = (-15, 0)

The y-intercept is (0, -ac + d); (0, -( $\frac{-1}{3})\*6-7$)

= (0, 2 – 7) = (0, -5)

*ANSWER*:

Domain: -∞ < x < ∞

Range: -∞ < y < ∞

x-intercept: (-15, 0)

y-intercept: (0, -5)

12.



*SOLUTION:*

Since this is a linear function, the domain and range are both *all real numbers.*

a = $\frac{1}{5}$, b = -5, c = -10, and d = 6

The x-intercept is ($\frac{ac-d}{ab}$, 0); ($\frac{\frac{1}{5}\*(-10)-6}{\frac{1}{5}\*-5}$, 0) = ($\frac{-2-6}{-1}$, 0) = ($\frac{-8}{-1}$, 0) = (8, 0)

The y-intercept is (0, -ac + d); (0, - $\frac{1}{5}\*-10+6$)

= (0, 2 + 6) = (0, 8)

*ANSWER*:

Domain: -∞ < x < ∞

Range: -∞ < y < ∞

x-intercept: (8, 0)

y-intercept: (0, 8)

**For questions 13-16, identify the domain, range, x-intercept, and y-intercept of the linear function described by the equation and the graph. Write the domain and range in set builder notation.**

14.



*SOLUTION:*

Since this is a linear function, the domain and range are both *all real numbers.*

a = -1, b = 3, c = 5, and d = -1

The x-intercept is ($\frac{ac-d}{ab}$, 0); ($\frac{-1\*5+1}{-1\*3}$, 0) = ($\frac{-5+1}{-3}$, 0) = ($\frac{-4}{-3}$, 0) = ($\frac{4}{3}$, 0)

The y-intercept is (0, -ac + d); (0, -(-1)\*5 – 1)

= (0, 5 – 1) = (0, 4)

*ANSWER*:

Domain: {x|x$ \in $ $R$}

Range: {y|y$ \in $ $R$}

x-intercept: ($\frac{4}{3}$, 0)

y-intercept: (0, 4)

16.



*SOLUTION:*

Since this is a linear function, the domain and range are both *all real numbers.*

a = $\frac{2}{3}$, b = $\frac{1}{3}$, c = -6, and d = -4

The x-intercept is ($\frac{ac-d}{ab}$, 0); ($\frac{\frac{2}{3}\*(-6)+4}{\frac{2}{3}\*\frac{1}{3}, }$, 0) = ($\frac{-4+4}{\frac{2}{9}, }$, 0) = ($\frac{0}{\frac{2}{9}, }$, 0) = (0, 0)

The y-intercept is (0, -ac + d); (0, -$\frac{2}{3}$\*-6 – 4)

= (0, 4 – 4) = (0, 0)

*ANSWER*:

Domain: {x|x$ \in $ $R$}

Range: {y|y$ \in $ $R$}

x-intercept: (0, 0)

y-intercept: (0, 0)

**For questions 17-20, identify the domain, range, x-intercept, and y-intercept of the linear function described by the equation and the graph. Write the domain and range as intervals.**

18.



*SOLUTION:*

Since this is a linear function, the domain and range are both *all real numbers.*

a = $\frac{1}{2}$, b = -6, c = 3, and d = 0

The x-intercept is ($\frac{ac-d}{ab}$, 0); ($\frac{\frac{1}{2}\*3}{\frac{1}{2}\*-6}$, 0) = ($\frac{\frac{3}{2}}{-3}$, 0) = ($\frac{-1}{2}$, 0) = (-0.5, 0)

The y-intercept is (0, -ac + d); (0, -$ \frac{1}{2}$\*3)

= (0, $\frac{-3}{2}$) = (0, -1.5)

*ANSWER*:

Domain: (-∞, ∞)

Range: (-∞, ∞)

x-intercept: (-.5, 0)

y-intercept: (0, -1.5)

20.



*SOLUTION:*

Since this is a linear function, the domain and range are both *all real numbers.*

a = -$\frac{1}{3}$, b = -$\frac{1}{4}$, c = 9, and d = -5

The x-intercept is ($\frac{ac-d}{ab}$, 0); ($\frac{-\frac{1}{3}\*9+5}{\frac{-1}{3}\*\frac{-1}{4}}$, 0) = ($\frac{-3+5}{\frac{1}{12}}$, 0) = ($\frac{2}{\frac{1}{12}}$, 0) = (24, 0)

The y-intercept is (0, -ac + d); (0, -($\frac{-1}{3}$)\*9 – 5)

= (0, 3 – 5) = (0, -2)

*ANSWER*:

Domain: (-∞, ∞)

Range: (-∞, ∞)

x-intercept: (24, 0)

y-intercept: (0, -2)