Pre-Class Problems 8 for Monday, February 19

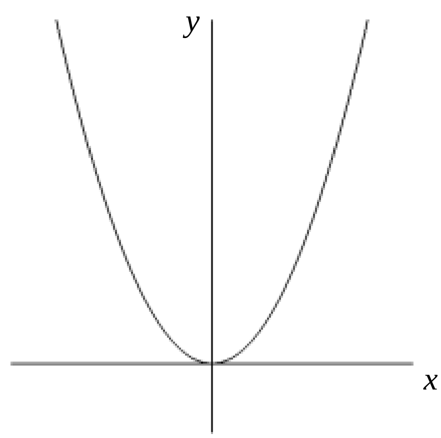
These are the type of problems that you will be working on in class.

You can go to the solution for each problem by clicking on the problem number or letter.

<u>Examples</u> Sketch the graph of the following equations. a is a positive real number.

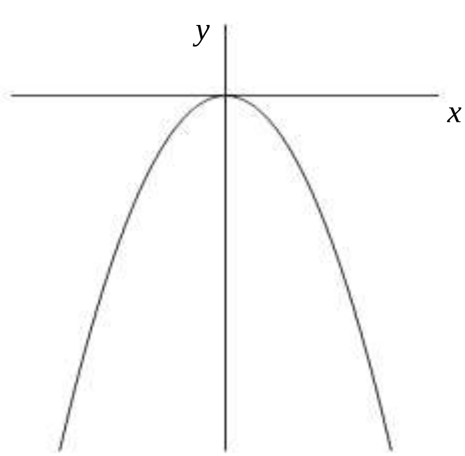
1. $y = a x^2$

NOTE: The graph of this equation is a parabola whose vertex is at the origin and opens upward.

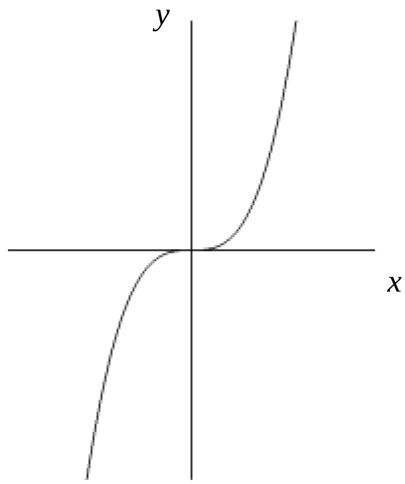


2. $y = -a x^2$

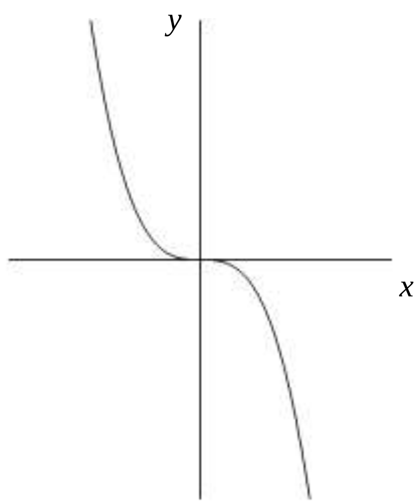
NOTE: The graph of this equation is a parabola whose vertex is at the origin and opens downward.



3. $y = ax^3$

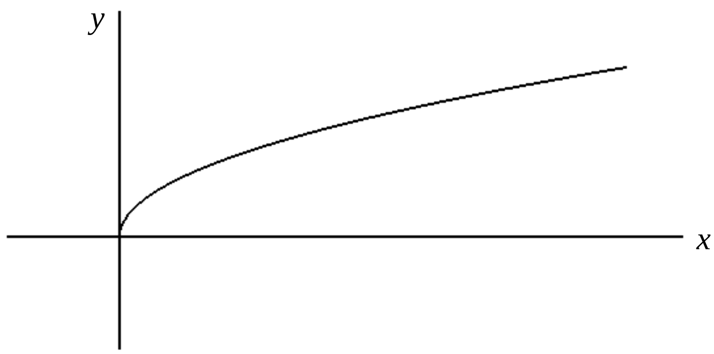


4. $y = -ax^3$



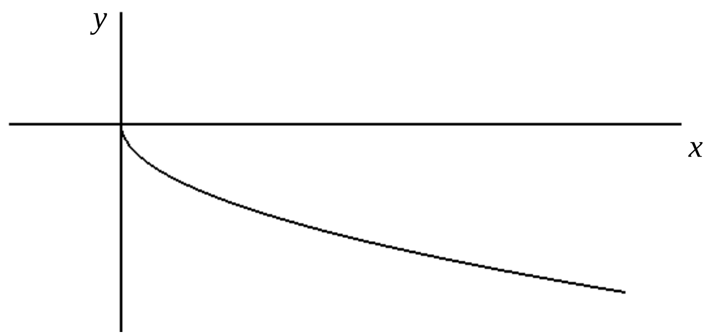
5. $y = \sqrt{ax}$ or $y = a\sqrt{x}$

NOTE: The graph of each equation is the top half of the parabola whose vertex is at the origin and opens to the right. The equation of the parabola whose vertex is at the origin and opens to the right can be given by the equation $x = ay^2$.

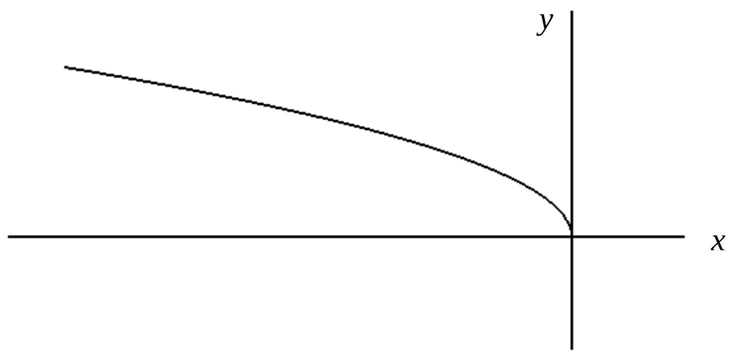


6. $y = -\sqrt{a\,x}$ or $y = -a\sqrt{x}$

NOTE: The graph of each equation is the bottom half of the parabola whose vertex is at the origin and opens to the right.

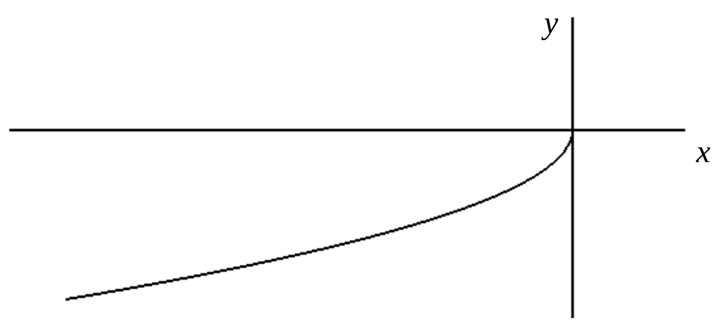


7. $y = \sqrt{-a\,x}$ or $y = a\sqrt{-x}$

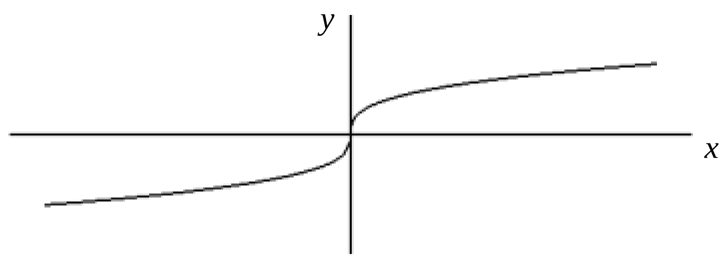


8. $y = -\sqrt{-a\,x}$ or $y = -a\sqrt{-x}$

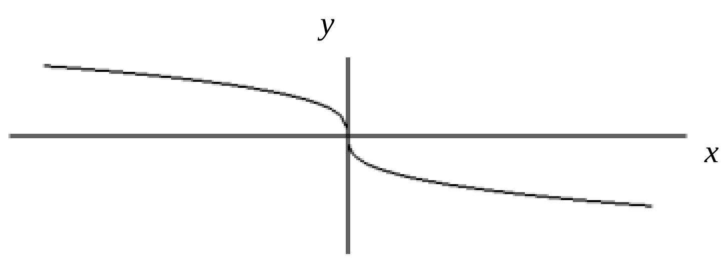
NOTE: The graph of each equation is the bottom half of the parabola whose vertex is at the origin and opens to the left.



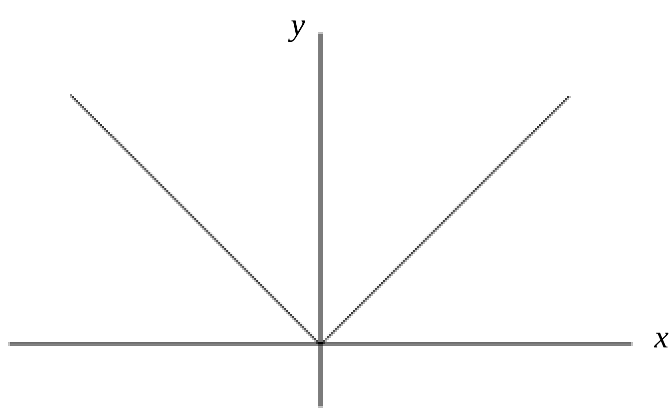
9. $y = \sqrt[3]{a x}$ or $y = a \sqrt[3]{x}$



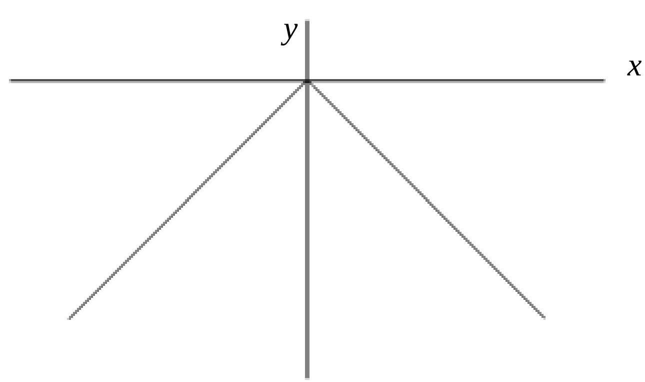
10. $y = -\sqrt[3]{a x}$ or $y = -a \sqrt[3]{x}$



11. $y = a \left| x \right|$

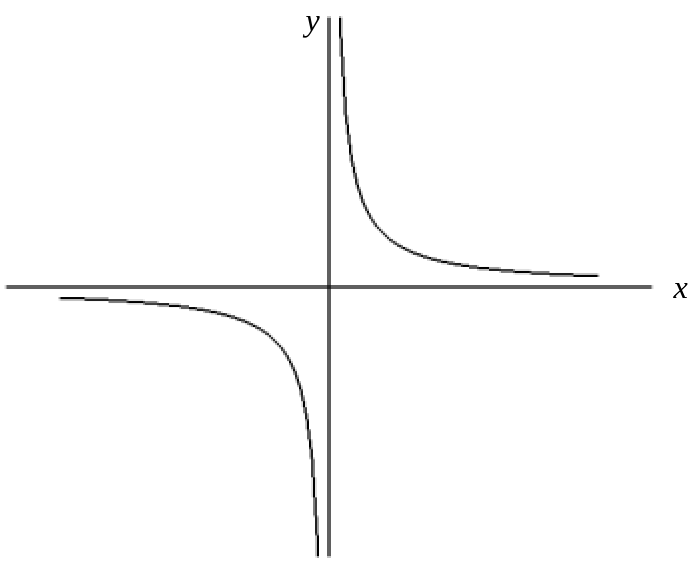


12. $y = -a \left| x \right|$



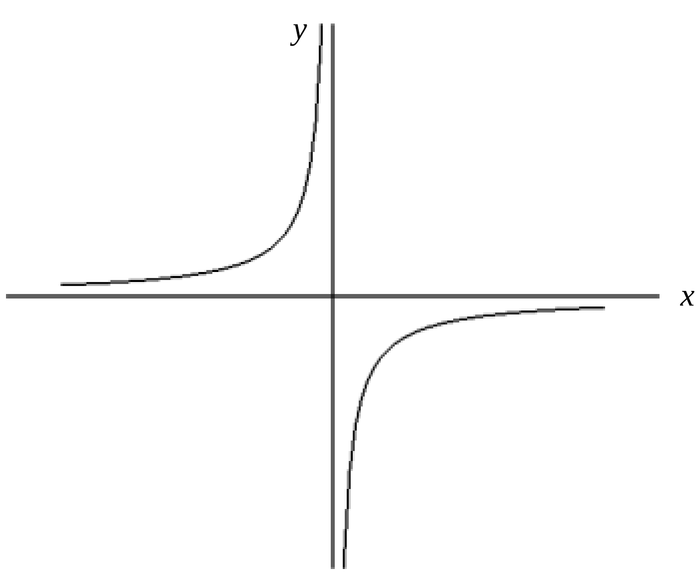
13. $y = \frac{a}{x}$ or $y = \frac{a}{x^n}$, where n is a positive odd integer

NOTE: The graph of each equation has the x-axis as a horizontal asymptote and the y-axis as a vertical asymptote.



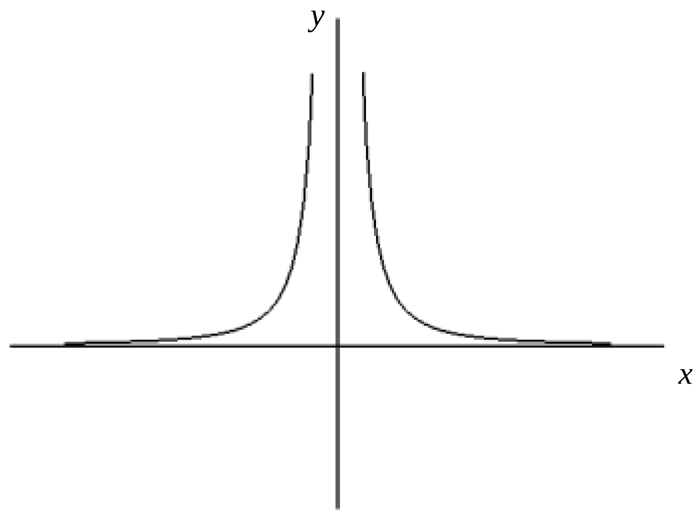
14. $y = -\frac{a}{x}$ or $y = -\frac{a}{x^n}$, where n is a positive odd integer

NOTE: The graph of each equation has the x-axis as a horizontal asymptote and the y-axis as a vertical asymptote.



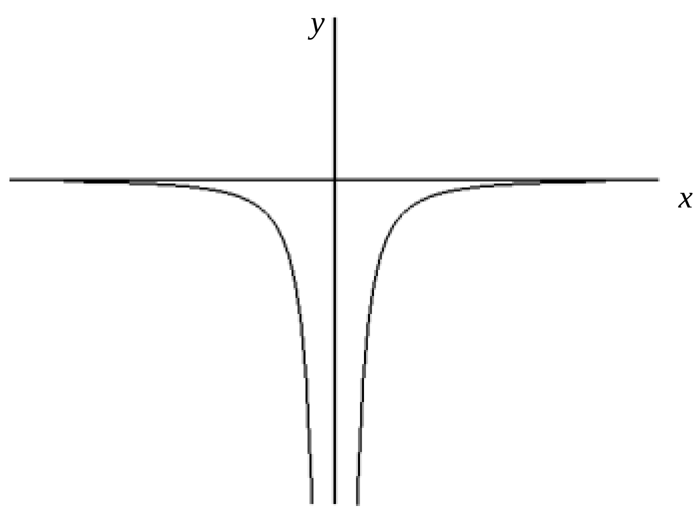
15. $y = \dfrac{a}{x^2}$ or $y = \dfrac{a}{x^n}$, where n is a positive even integer

NOTE: The graph of each equation has the *x*-axis as a horizontal asymptote and the *y*-axis as a vertical asymptote.



16. $y = -\dfrac{a}{x^2}$ or $y = -\dfrac{a}{x^n}$, where n is a positive even integer

NOTE: The graph of each equation has the *x*-axis as a horizontal asymptote and the *y*-axis as a vertical asymptote.



1. Sketch the graph of the following functions. State the domain of the function and use the sketch to state the range of the function. Find the *x*-intercept(s) or *t*-intercept(s) and the *y*-intercept.

a. $f(x) = 2(x - 4)^2 - 3$

b. $g(x) = -5(x + 12)^2$

c. $h(x) = \dfrac{3}{4}(x + 2)^3 + 6$

d. $f(t) = -(t - 8)^3 + 3$

e. $g(x) = 2\sqrt{x} - 4$

f. $h(t) = \sqrt{-5t - 30} - 11$

g. $y = -\dfrac{11}{6}\sqrt{3x - 7} + 2$

h. $f(x) = \sqrt[3]{5 - x} - 4$

i. $g(x) = |6x - 18|$

j. $h(x) = -|4x + 9| + 7$

k. $f(x) = \dfrac{4}{3x^2} + 8$

l. $g(x) = -\dfrac{14}{2x + 5} - 6$

Additional problems available in the textbook: Page 239 … 9 – 32, 41 – 46, 55 – 78, 87 – 90 and Examples 1 – 4, 7, 8 starting on page 230.

SOLUTIONS:

1a. $f(x) = 2(x - 4)^2 - 3$

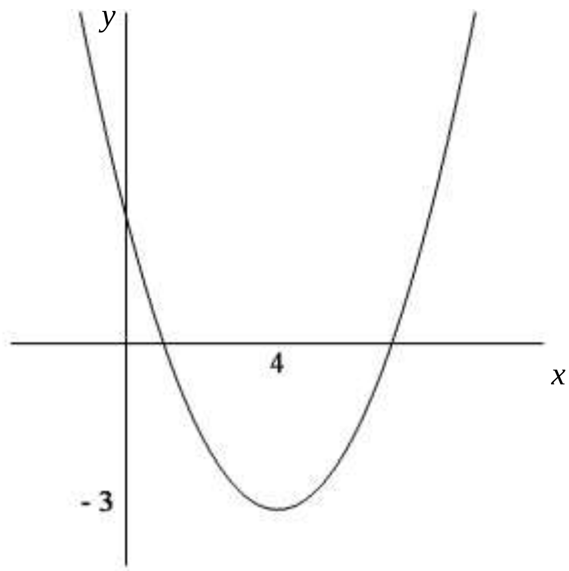
Back to Problem 1.

The domain of f is the set of all real numbers.

To graph the function f, we set $f(x) = y$ and graph the equation $y = 2(x - 4)^2 - 3$.

$$y = 2(x - 4)^2 - 3 \Rightarrow y + 3 = 2(x - 4)^2$$

The graph of $y + 3 = 2(x - 4)^2$ is the graph of $y = 2x^2$ shifted 4 units to the right and 3 units downward.



The range of f is $[-3, \infty)$.

NOTE: The horizontal shift of 4 units to the right is determined from the expression $x - 4$ in the equation $y + 3 = 2(x - 4)^2$ and the vertical shift of 3 units downward is determined from the expression $y + 3$ in the equation.

To find the *y*-coordinate of the *y*-intercept of the graph of the equation $y = 2(x - 4)^2 - 3$, we would set $x = 0$ obtaining that $y = 2(-4)^2 - 3$. Thus, $y = 32 - 3 = 29$. Thus, the *y*-intercept is the point $(0, 29)$.

To find the *x*-coordinate of the *x*-intercepts of the graph of the equation $y + 3 = 2(x - 4)^2$, we would set $y = 0$ obtaining that $3 = 2(x - 4)^2$. Solving for *x*, we have that $3 = 2(x - 4)^2 \Rightarrow$

$$\frac{3}{2} = (x - 4)^2 \Rightarrow x - 4 = \pm\sqrt{\frac{3}{2}} \Rightarrow x - 4 = \pm\frac{\sqrt{6}}{2} \Rightarrow$$

$x = 4 \pm \dfrac{\sqrt{6}}{2} = \dfrac{8}{2} \pm \dfrac{\sqrt{6}}{2} = \dfrac{8 \pm \sqrt{6}}{2}$. Thus, the x-intercepts are the points $\left(\dfrac{8 - \sqrt{6}}{2}, 0 \right)$ and $\left(\dfrac{8 + \sqrt{6}}{2}, 0 \right)$.

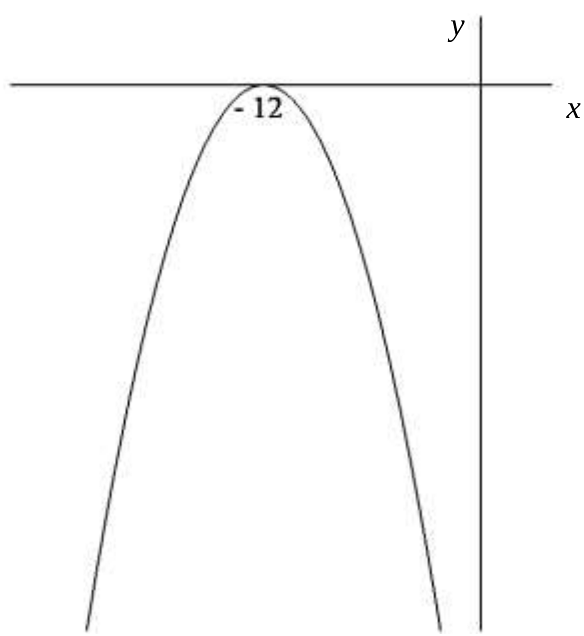
1b. $g(x) = -5(x + 12)^2$

Back to Problem 1.

The domain of g is the set of all real numbers.

To graph the function g, we set $g(x) = y$ and graph the equation $y = -5(x + 12)^2$.

The graph of $y = -5(x + 12)^2$ is the graph of $y = -5x^2$ shifted 12 units to the left. There is no vertical shift.



The range of g is $(-\infty, 0]$.

NOTE: The horizontal shift of 12 units to the left is determined from the expression $x + 12$ in the equation $y = -5(x + 12)^2$.

To find the y-coordinate of the y-intercept of the graph of the equation $y = -5(x + 12)^2$, we would set $x = 0$ obtaining that

$y = -5(12)^2$. Thus, $y = -5(144) = -720$. Thus, the y-intercept is the point $(0, -720)$.

To find the x-coordinate of the x-intercept of the graph of the equation $y = -5(x + 12)^2$, we would set $y = 0$ obtaining that $0 = -5(x + 12)^2$. Solving for x, we have that $0 = -5(x + 12)^2 \Rightarrow 0 = (x + 12)^2 \Rightarrow x + 12 = 0 \Rightarrow x = -12$. Thus, the x-intercept is the point $(-12, 0)$. Of course, we could have obtain this from the sketch of the graph of the equation $y = -5(x + 12)^2$.

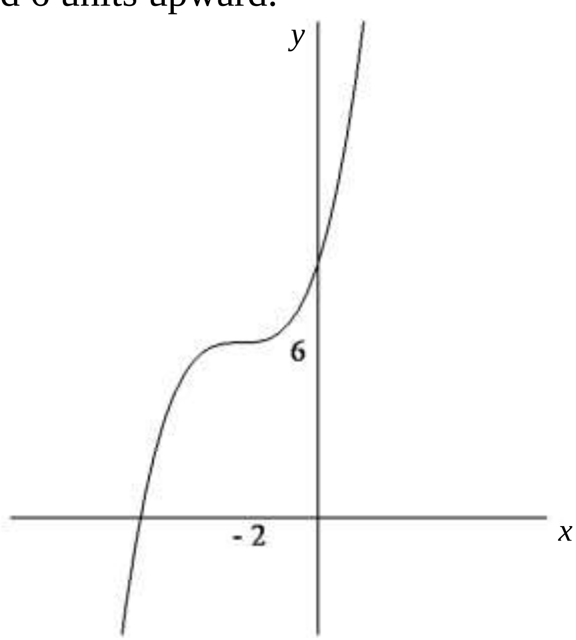
1c. $h(x) = \dfrac{3}{4}(x + 2)^3 + 6$ Back to Problem 1.

The domain of h is the set of all real numbers.

To graph the function h, we set $h(x) = y$ and graph the equation $y = \dfrac{3}{4}(x + 2)^3 + 6$.

$$y = \frac{3}{4}(x + 2)^3 + 6 \Rightarrow y - 6 = \frac{3}{4}(x + 2)^3$$

The graph of $y - 6 = \dfrac{3}{4}(x + 2)^3$ is the graph of $y = \dfrac{3}{4}x^3$ shifted 2 units to the left and 6 units upward.



The range of h is the set of all real numbers.

NOTE: The horizontal shift of 2 units to the left is determined from the expression $x+2$ in the equation $y-6=\frac{3}{4}(x+2)^3$ and the vertical shift of 6 units upward is determined from the expression $y-6$ in the equation.

To find the *y*-coordinate of the *y*-intercept of the graph of the equation $y=\frac{3}{4}(x+2)^3+6$, we would set $x=0$ obtaining that $y=\frac{3}{4}(2)^3+6$. Thus, $y=\frac{3}{4}(8)+6=6+6=12$. Thus, the *y*-intercept is the point $(0,12)$.

To find the *x*-coordinate of the *x*-intercept of the graph of the equation $y-6=\frac{3}{4}(x+2)^3$, we would set $y=0$ obtaining that $-6=\frac{3}{4}(x+2)^3$. Solving for *x*, we have that $-6=\frac{3}{4}(x+2)^3 \Rightarrow$ $-24=3(x+2)^3 \Rightarrow -8=(x+2)^3 \Rightarrow x+2=\sqrt[3]{-8} \Rightarrow$ $x+2=-2 \Rightarrow x=-4$. Thus, the *x*-intercept is the point $(-4,0)$.

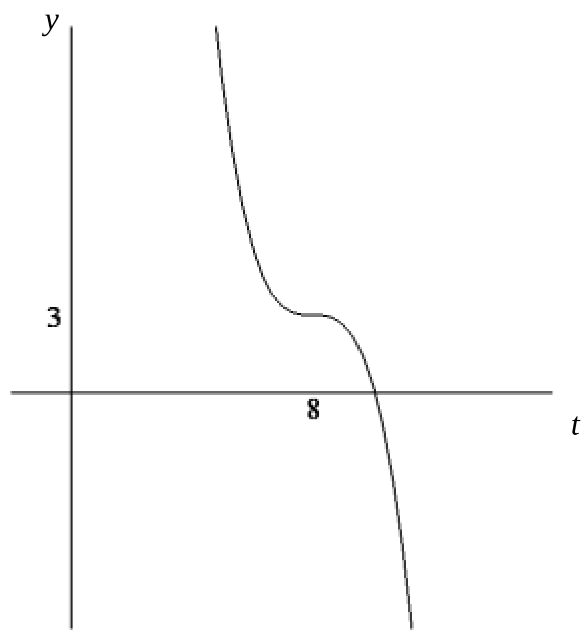
1d. $f(t)=-(t-8)^3+3$ Back to Problem 1.

The domain of f is the set of all real numbers.

To graph the function *f*, we set $f(t)=y$ and graph the equation $y=-(t-8)^3+3$.

$$y=-(t-8)^3+3 \Rightarrow y-3=-(t-8)^3$$

The graph of $y-3=-(t-8)^3$ is the graph of $y=-t^3$ shifted 8 units to the right and 3 units upward.



The range of f is the set of all real numbers.

NOTE: The horizontal shift of 8 units to the right is determined from the expression $t - 8$ in the equation $y - 3 = -(t - 8)^3$ and the vertical shift of 3 units upward is determined from the expression $y - 3$ in the equation.

To find the y-coordinate of the y-intercept of the graph of the equation $y = -(t - 8)^3 + 3$, we would set $t = 0$ obtaining that $y = -(-8)^3 + 3$. Thus, $y = -(-512) + 3 = 512 + 3 = 515$. Thus, the y-intercept is the point $(0, 515)$.

To find the t-coordinate of the t-intercept of the graph of the equation $y - 3 = -(t - 8)^3$, we would set $y = 0$ obtaining that $-3 = -(t - 8)^3$. Solving for t, we have that $-3 = -(t - 8)^3 \Rightarrow 3 = (t - 8)^3 \Rightarrow t - 8 = \sqrt[3]{3} \Rightarrow t = 8 + \sqrt[3]{3}$. Thus, the t-intercept is the point $(8 + \sqrt[3]{3}, 0)$.

1e. $g(x) = 2\sqrt{x} - 4$ Back to Problem 1.

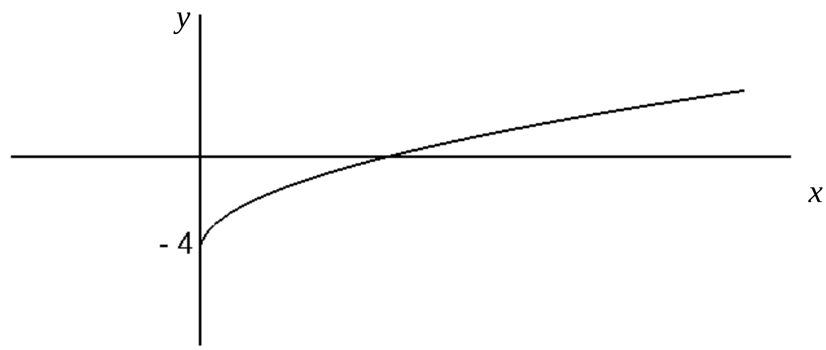
The domain of g is $[0, \infty)$.

To graph the function g, we set $g(x) = y$ and graph the equation

$y = 2\sqrt{x} - 4$.

$$y = 2\sqrt{x} - 4 \Rightarrow y + 4 = 2\sqrt{x}$$

The graph of $y + 4 = 2\sqrt{x}$ is the graph of $y = 2\sqrt{x}$ shifted 4 units downward. There is no horizontal shift.



The range of g is $[-4, \infty)$.

NOTE: The vertical shift of 4 units downward is determined from the expression $y + 4$ in the equation $y + 4 = 2\sqrt{x}$.

To find the y-coordinate of the y-intercept of the graph of the equation $y = 2\sqrt{x} - 4$, we would set $x = 0$ obtaining that $y = 2\sqrt{0} - 4$. Thus, $y = 2(0) - 4 = -4$. Thus, the y-intercept is the point $(0, -4)$. Of course, we could have obtain this from the sketch of the graph of the equation $y = 2\sqrt{x} - 4$.

To find the x-coordinate of the x-intercept of the graph of the equation $y + 4 = 2\sqrt{x}$, we would set $y = 0$ obtaining that $4 = 2\sqrt{x}$. Solving for x, we have that $4 = 2\sqrt{x} \Rightarrow 2 = \sqrt{x} \Rightarrow x = 4$. Thus, the x-intercept is the point $(4, 0)$.

1f. $h(t) = \sqrt{-5t - 30} - 11$ Back to Problem 1.

To graph the function h, we set $h(t) = y$ and graph the equation

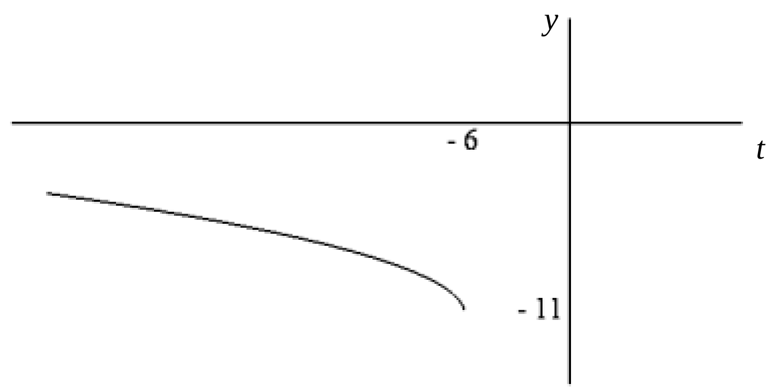
$y = \sqrt{-5t - 30} - 11$.

NOTE: The coefficient of the t variable in the expression $-5t - 30$ is **not** one. We will need to factor out the coefficient of -5 in order to identify the amount and the direction of the horizontal shift.

$$y = \sqrt{-5t - 30} - 11 \Rightarrow y + 11 = \sqrt{-5(t + 6)}$$

For the domain of h, we need that $-5(t + 6) \geq 0$. Thus, $t + 6 \leq 0 \Rightarrow t \leq -6$. Thus, the domain of h is $(-\infty, -6]$.

The graph of $y + 11 = \sqrt{-5(t + 6)}$ is the graph of $y = \sqrt{-5t}$ shifted 6 units to the left and 11 units downward.



The range of h is $[-11, \infty)$.

NOTE: The horizontal shift of 6 units to the left is determined from the expression $t + 6$ in the equation $y + 11 = \sqrt{-5(t + 6)}$ and the vertical shift of 11 units downward is determined from the expression $y + 11$ in the equation.

To find the y-coordinate of the y-intercept of the graph of the equation $y = \sqrt{-5t - 30} - 11$, we would set $t = 0$ obtaining that $y = \sqrt{-30} - 11$. Thus, $y = -11 + i\sqrt{30}$, a complex number. Thus, the equation $y = \sqrt{-5t - 30} - 11$ does not have a y-intercept. Of course, we could have obtain this from the sketch of the graph of the equation $y = \sqrt{-5t - 30} - 11$.

To find the t-coordinate of the t-intercept of the graph of the equation $y + 11 = \sqrt{-5(t + 6)}$, we would set $y = 0$ obtaining that $11 = \sqrt{-5(t + 6)}$. Solving for t, we have that $11 = \sqrt{-5(t + 6)} \Rightarrow$ $121 = -5(t + 6) \Rightarrow 121 = -5t - 30 \Rightarrow -5t = 151 \Rightarrow t = -\dfrac{151}{5}$.

Thus, the t-intercept is the point $\left(-\dfrac{151}{5}, 0\right)$.

1g. $y = -\dfrac{11}{6}\sqrt{3x - 7} + 2$ Back to Problem 1.

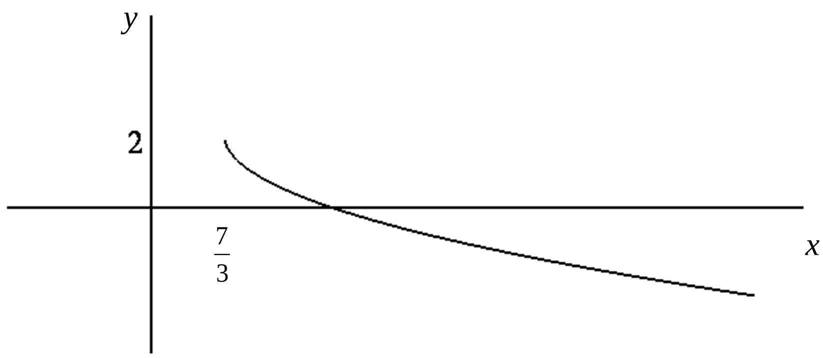
NOTE: Functional notation is not being used here. However, we still have a function. The variable y is a function of the variable x. If we wanted, we could introduce functional notation by writing $y(x) = -\dfrac{11}{6}\sqrt{3x - 7} + 2$. The name of the function would become y when you do this.

NOTE: The coefficient of the x variable in the expression $3x - 7$ is **not** one. We will need to factor out the coefficient of 3 in order to identify the amount of the horizontal shift.

$$y = -\frac{11}{6}\sqrt{3x - 7} + 2 \Rightarrow y - 2 = -\frac{11}{6}\sqrt{3\left(x - \frac{7}{3}\right)}$$

For the domain of the function, we need that $3\left(x - \dfrac{7}{3}\right) \geq 0$. Thus, $x - \dfrac{7}{3} \geq 0 \Rightarrow x \geq \dfrac{7}{3}$. Thus, the domain of the function is $\left[\dfrac{7}{3}, \infty\right)$.

The graph of $y - 2 = -\dfrac{11}{6}\sqrt{3\left(x - \dfrac{7}{3}\right)}$ is the graph of $y = -\dfrac{11}{6}\sqrt{3x}$ shifted $\dfrac{7}{3}$ units to the right and 2 units upward.



The range of the function is $(-\infty, 2]$.

NOTE: The horizontal shift of $\dfrac{7}{3}$ units to the right is determined from the expression $x + \dfrac{7}{3}$ in the equation $y - 2 = -\dfrac{11}{6}\sqrt{3\left(x - \dfrac{7}{3}\right)}$ and the vertical shift of 2 units upward is determined from the expression $y - 2$ in the equation.

To find the y-coordinate of the y-intercept of the graph of the equation $y = -\dfrac{11}{6}\sqrt{3x - 7} + 2$, we would set $x = 0$ obtaining that $y = -\dfrac{11}{6}\sqrt{-7} + 2$. Since $\sqrt{-7} = i\sqrt{7}$, then y is a complex number. Thus, the equation $y = -\dfrac{11}{6}\sqrt{3x - 7} + 2$ does not have a y-intercept. Of course, we could have obtain this from the sketch of the graph of the equation $y = -\dfrac{11}{6}\sqrt{3x - 7} + 2$.

To find the x-coordinate of the x-intercept of the graph of the equation $y - 2 = -\dfrac{11}{6}\sqrt{3x - 7}$, we would set $y = 0$ obtaining that $-2 = -\dfrac{11}{6}\sqrt{3x - 7}$. Solving for x, we have that $-2 = -\dfrac{11}{6}\sqrt{3x - 7} \Rightarrow$ $\dfrac{12}{11} = \sqrt{3x - 7} \Rightarrow 3x - 7 = \dfrac{144}{121} \Rightarrow 363x - 847 = 144 \Rightarrow$

$363x = 991 \Rightarrow x = \dfrac{991}{363}$. Thus, the x-intercept is the point $\left(\dfrac{991}{363}, 0 \right)$.

1h. $f(x) = \sqrt[3]{5 - x} - 4$ Back to Problem 1.

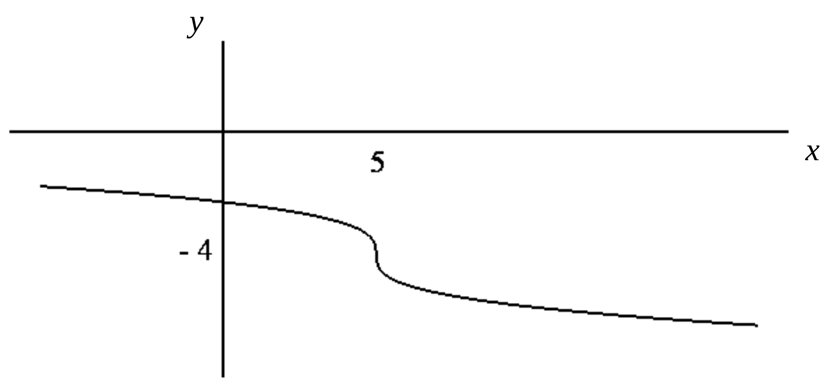
The domain of f is the set of all real numbers.

To graph the function f, we set $f(x) = y$ and graph the equation $y = \sqrt[3]{5 - x} - 4$.

NOTE: The coefficient of the x variable in the expression $5 - x$ is **not** one. We will need to factor out the coefficient of -1 in order to identify the amount and the direction of the horizontal shift.

$$y = \sqrt[3]{5 - x} - 4 \Rightarrow y + 4 = \sqrt[3]{-(x - 5)} \Rightarrow y + 4 = -\sqrt[3]{x - 5}$$

The graph of $y + 4 = -\sqrt[3]{x - 5}$ is the graph of $y = -\sqrt[3]{x}$ shifted 5 units to the right and 4 units downward.



The range of f is the set of all real numbers.

NOTE: The horizontal shift of 5 units to the right is determined from the expression $x - 5$ in the equation $y + 4 = -\sqrt[3]{x - 5}$ and the vertical shift of 4 units downward is determined from the expression $y + 4$ in the equation.

To find the y-coordinate of the y-intercept of the graph of the equation $y = \sqrt[3]{5 - x} - 4$, we would set $x = 0$ obtaining that $y = \sqrt[3]{5} - 4$. Thus, the y-intercept is the point $(0, \sqrt[3]{5} - 4)$.

To find the x-coordinate of the x-intercept of the graph of the equation $y + 4 = \sqrt[3]{5 - x}$, we would set $y = 0$ obtaining that $4 = \sqrt[3]{5 - x}$. Solving for x, we have that $4 = \sqrt[3]{5 - x} \Rightarrow 64 = 5 - x \Rightarrow x = -59$. Thus, the x-intercept is the point $(-59, 0)$.

1i. $g(x) = |6x - 18|$ Back to Problem 1.

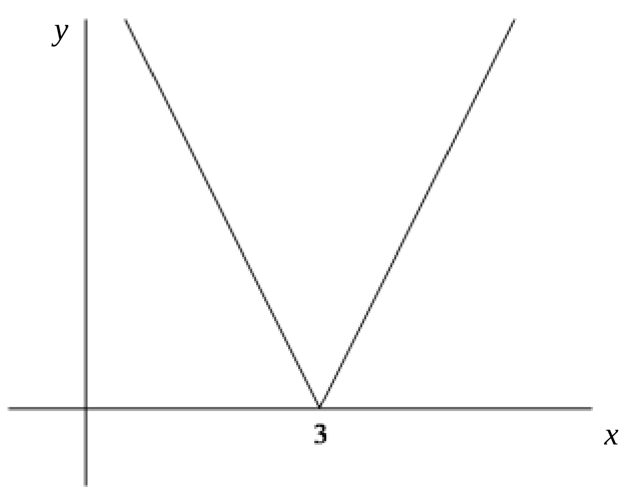
The domain of g is the set of all real numbers.

To graph the function g, we set $g(x) = y$ and graph the equation $y = |6x - 18|$.

NOTE: The coefficient of the x variable in the expression $6x - 18$ is **not** one. We will need to factor out the coefficient of 6 in order to identify the amount of the horizontal shift.

$$y = |6x - 18| \Rightarrow y = |6(x - 3)| \Rightarrow y = 6|x - 3|$$

The graph of $y = 6|x - 3|$ is the graph of $y = 6|x|$ shifted 3 units to the right. There is no vertical shift.



The range of g is $[0, \infty)$.

NOTE: The horizontal shift of 3 units to the right is determined from the expression $x - 3$ in the equation $y = 6|x - 3|$.

To find the *y*-coordinate of the *y*-intercept of the graph of the equation $y = 6|x - 3|$, we would set $x = 0$ obtaining that $y = 6|-3|$. Thus, $y = 6|-3| = 18$ Thus, the *y*-intercept is the point $(0, 18)$.

To find the *x*-coordinate of the *x*-intercept of the graph of the equation $y = 6|x - 3|$, we would set $y = 0$ obtaining that $0 = 6|x - 3|$. Solving for *x*, we have that $0 = 6|x - 3| \Rightarrow 0 = |x - 3| \Rightarrow$ $0 = x - 3 \Rightarrow x = 3$. Thus, the *x*-intercept is the point $(3, 0)$. Of course, we could have obtain this from the sketch of the graph of the equation $y = 6|x - 3|$.

1j. $h(x) = -|4x + 9| + 7$ Back to Problem 1.

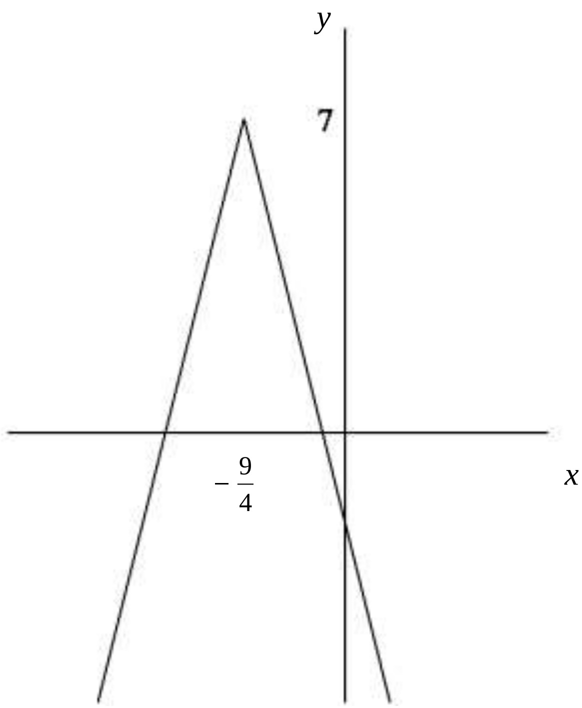
The domain of h is the set of all real numbers.

To graph the function h, we set $h(x) = y$ and graph the equation $y = -|4x + 9| + 7$.

NOTE: The coefficient of the *x* variable in the expression $4x + 9$ is **not** one. We will need to factor out the coefficient of 4 in order to identify the amount of the horizontal shift.

$$y - 7 = -|4x + 9| \Rightarrow y - 7 = -\left|4\left(x + \frac{9}{4}\right)\right| \Rightarrow y - 7 = -4\left|x + \frac{9}{4}\right|$$

The graph of $y - 7 = -4\left|x + \frac{9}{4}\right|$ is the graph of $y = -4|x|$ shifted $\frac{9}{4}$ units to the left and 7 units upward.



The range of h is $(-\infty, 7]$.

NOTE: The horizontal shift of $\frac{9}{4}$ units to the left is determined from the expression $x + \frac{9}{4}$ in the equation $y - 7 = -4\left|x + \frac{9}{4}\right|$ and the vertical shift of 7 units upward is determined from the expression $y - 7$ in the equation.

To find the *y*-coordinate of the *y*-intercept of the graph of the equation $y = -|4x + 9| + 7$, we would set $x = 0$ obtaining that $y = -|9| + 7$. Thus, $y = -|9| + 7 = -9 + 7 = -2$ Thus, the *y*-intercept is the point $(0, -2)$.

To find the *x*-coordinate of the *x*-intercepts of the graph of the equation $y - 7 = -|4x + 9|$, we would set $y = 0$ obtaining that $-7 = -|4x + 9|$. Solving for *x*, we have that $-7 = -|4x + 9| \Rightarrow$ $7 = |4x + 9| \Rightarrow 4x + 9 = \pm 7 \Rightarrow 4x = -9 \pm 7 \Rightarrow x = \dfrac{-9 \pm 7}{4}$.

$x = \frac{-9+7}{4} = \frac{-2}{4} = -\frac{1}{2}$ or $x = \frac{-9-7}{4} = \frac{-16}{4} = -4$ Thus, the *x*-intercepts are the points $(-4, 0)$ and $\left(-\frac{1}{2}, 0\right)$.

1k. $f(x) = \frac{4}{3x^2} + 8$ Back to Problem 1.

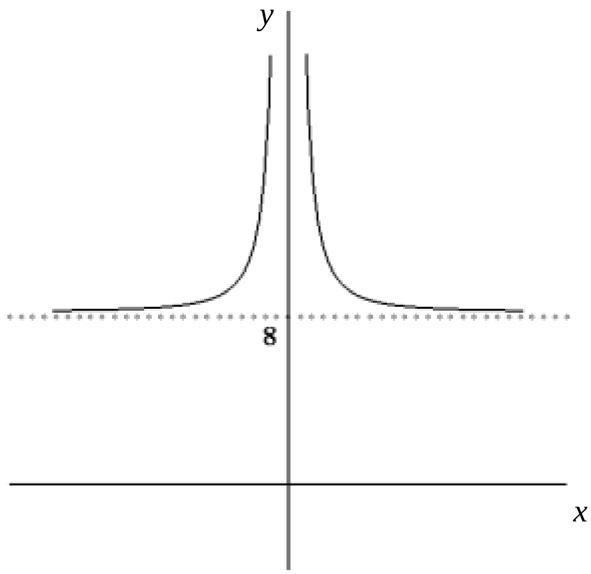
The domain of f is the set of all real numbers x such that $x \neq 0$.

To graph the function *f*, we set $f(x) = y$ and graph the equation $y = \frac{4}{3x^2} + 8$.

$$y = \frac{4}{3x^2} + 8 \Rightarrow y - 8 = \frac{4}{3x^2}$$

The graph of $y - 8 = \frac{4}{3x^2}$ is the graph of $y = \frac{4}{3x^2}$ shifted 8 units upward. There is no horizontal shift.

NOTE: We know that the graph of $y = \frac{4}{3x^2}$ has the *x*-axis as a horizontal asymptote. The vertical shift of 8 units upward will shift this horizontal asymptote 8 units upward. Thus, the graph of $y - 8 = \frac{4}{3x^2}$ will have the line $y = 8$ as a horizontal asymptote. We also know that the graph of $y = \frac{4}{3x^2}$ has the *y*-axis as a vertical asymptote. The vertical shift will not affect this vertical line. Thus, the graph of $y - 8 = \frac{4}{3x^2}$ will have the *y*-axis as a vertical asymptote.



The range of f is $(8, \infty)$.

NOTE: The vertical shift of 8 units upward is determined from the expression $y - 8$ in the equation $y - 8 = \dfrac{4}{3x^2}$.

NOTE: From the sketch of the graph of the equation $y - 8 = \dfrac{4}{3x^2}$, we can see that the graph does not have any *x*-intercepts nor a *y*-intercept.

11. $g(x) = -\dfrac{14}{2x + 5} - 6$ Back to Problem 1.

The domain of g is the set of all real numbers x such that $x \neq -\dfrac{5}{2}$.

To graph the function g, we set $g(x) = y$ and graph the equation

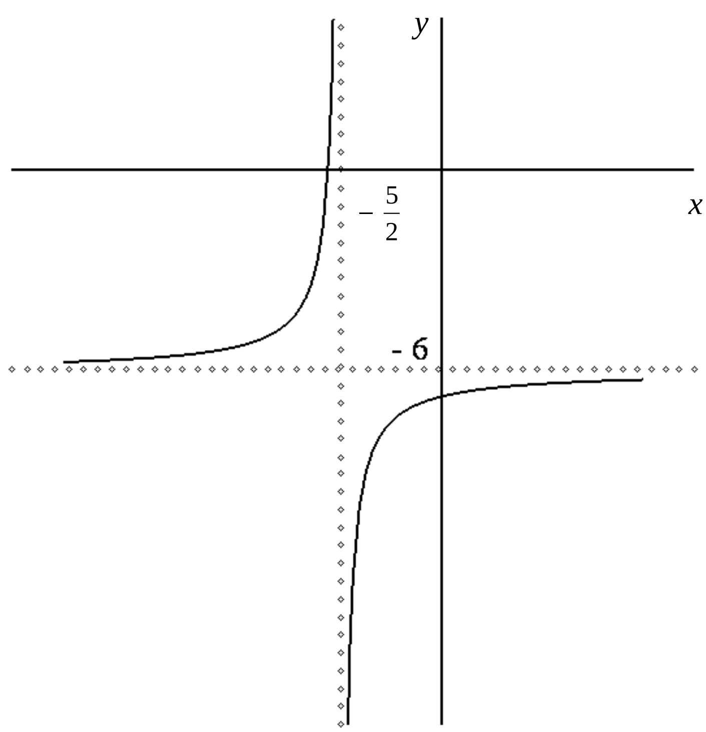
$$y = -\frac{14}{2x + 5} - 6.$$

NOTE: The coefficient of the *x* variable in the expression $2x + 5$ is **not** one. We will need to factor out the coefficient of 2 in order to identify the amount of the horizontal shift.

$$y = -\frac{14}{2x + 5} - 6 \Rightarrow y + 6 = -\frac{14}{2\left(x + \frac{5}{2}\right)} \Rightarrow y + 6 = -\frac{7}{x + \frac{5}{2}}$$

The graph of $y + 6 = -\frac{7}{x + \frac{5}{2}}$ is the graph of $y = -\frac{7}{x}$ shifted $\frac{5}{2}$ units to left and 6 units downward.

NOTE: We know that the graph of $y = -\frac{7}{x}$ has the x-axis as a horizontal asymptote. The vertical shift of 6 units downward will shift this horizontal asymptote 6 units downward. The horizontal shift will not affect this horizontal line. Thus, the graph of $y + 6 = -\frac{7}{x + \frac{5}{2}}$ will have the line $y = -6$ as a horizontal asymptote. We also know that the graph of $y = -\frac{7}{x}$ has the y-axis as a vertical asymptote. The horizontal shift of $\frac{5}{2}$ units to the left will shift this vertical asymptote $\frac{5}{2}$ units to the left. The vertical shift will not affect this vertical line. Thus, the graph of $y + 6 = -\frac{7}{x + \frac{5}{2}}$ will have the line $x = -\frac{5}{2}$ as a vertical asymptote.



The range of g is $(-\infty, -6) \cup (-6, \infty)$.

NOTE: The horizontal shift of $\frac{5}{2}$ units to the left is determined from the expression $x + \frac{5}{2}$ in the equation $y + 6 = -\frac{7}{x + \frac{5}{2}}$ and the vertical shift of 6 units downward is determined from the expression $y + 6$ in the equation.

To find the *y*-coordinate of the *y*-intercept of the graph of the equation $y = -\frac{14}{2x + 5} - 6$, we would set $x = 0$ obtaining that $y = -\frac{14}{5} - 6$. Thus, $y = -\frac{14}{5} - 6 = -\frac{14}{5} - \frac{30}{5} = -\frac{44}{5}$ Thus, the *y*-intercept is the point $\left(0, -\frac{44}{5}\right)$.

To find the *x*-coordinate of the *x*-intercept of the graph of the equation $y + 6 = -\frac{14}{2x + 5}$, we would set $y = 0$ obtaining that $6 = -\frac{14}{2x + 5}$. Solving for *x*, we have that $6 = -\frac{14}{2x + 5} \Rightarrow$

$6(2x + 5) = -14 \Rightarrow 3(2x + 5) = -7 \Rightarrow 6x + 15 = -7 \Rightarrow$

$6x = -22 \Rightarrow x = -\frac{11}{3}$. Thus, the *x*-intercept is the points $\left(-\frac{11}{3}, 0\right)$.