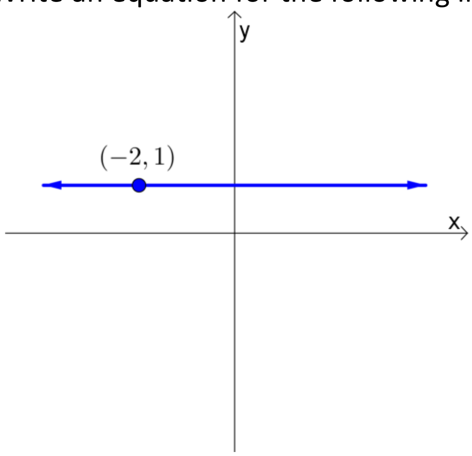
Homework

1. Find an equation of the line through $(0, -4)$ with slope $\frac{2}{3}$. Then rewrite the equation in slope-intercept form. Finally, graph the line.
2. Find an equation of the line through $(2, 5)$ with slope -1. Then rewrite the equation in slope-intercept form. Finally, graph the line.
3. Find an equation of the line through $\left(-1, \frac{1}{2}\right)$ and $\left(0, -\frac{2}{3}\right)$. Then rewrite the equation in slope-intercept form.
4. Graph the line $x = -2$. What is the slope of the line?
5. Graph the line $y = 6$. What is the slope of the line?
6. Write an equation for the following line. What is the slope of the line?



7. Graph $f(x) = x^2 - 2$ by finding and plotting the vertex, x-intercepts, and y-intercept.
8. Graph $f(x) = 2x^2 + 4x - 6$ by finding and plotting the vertex, x-intercepts, and y-intercept.
9. Suppose $f(x) = \begin{cases} 1 - 3x & \text{if } x \le 4 \\ \frac{2}{x} & \text{if } x > 4 \end{cases}$. Find $f(8)$, $f(0)$, and $f(-1)$.
10. Suppose $f(x) = \begin{cases} \sqrt{x + 14} & \text{if } x < -6 \\ 2x^2 + 1 & \text{if } -6 \le x \le -1 \\ \sqrt[3]{x} & \text{if } x > -1 \end{cases}$. Find $f(-10)$, $f(-6)$, $f(-1)$, $f(0)$, and $f(27)$.
11. Find $f(x + 1)$ where $f(x) = x^2 - 3x + 2$. Simplify.
12. Find $f(x + h)$ where $f(x) = \frac{x}{x+1}$.
13. Find $\frac{f(x+h)-f(x)}{h}$ where $f(x) = 2x - 3$. Simplify.
14. Find $\frac{f(x+h)-f(x)}{h}$ where $f(x) = x^2$. Simplify.
15. Find the domain of $f(x) = \frac{x+1}{x^2-x-2}$.
16. Find the domain of $f(x) = \sqrt{6 - 2x}$.
17. Find the domain of $f(x) = \frac{x-1}{\sqrt{x+2}}$.
18. Factor completely.
    a) $3x^4 + 4x^3$ b) $12x^2 + 36x - 48$ c) $6x^2 + 6x - 12$ d) $x^2 - 2x + 1$ e) $4x^2 - 9$
    f) $x^3 - 4x^2 - 3x + 12$
19. Rewrite the following using rational exponents.
    a) $\sqrt{x}$ b) $\sqrt[4]{x}$ c) $\sqrt[5]{x^2}$ d) $\frac{3}{x}$ e) $\frac{5}{x^2}$ f) $\frac{1}{x^5}$ g) $\frac{1}{\sqrt{x}}$
20. Rewrite the following using radicals or fractions.
    a) $x^{\frac{1}{3}}$ b) $x^{\frac{3}{4}}$ c) $x^{\frac{1}{2}}$ d) $4x^{-1}$ e) x^{-3} f) $x^{-\frac{2}{3}}$

21. Suppose the demand function for x hundred units of a textbook is:

    $D(x) = -0.37x + 47$ (in dollars)

    and the cost of producing x hundred textbooks is:

    $C(x) = 1.38x^2 + 15.15x + 115.5$ (in hundreds of dollars).

    Find the revenue $R(x)$ and profit $P(x)$.

22. Suppose that when the price of a water bottle is p dollars per unit, then x thousand units will be purchased by consumers, where $p = -0.01x + 4$. The cost of producing x thousand bottles is $C(x) = 0.005x^2 + x + 120$ thousand dollars.

    a) Find the profit function, $P(x)$. (Notice that big P and little p mean two different things. Like passwords, math is case sensitive! ☺)

    b) Using $P(x)$, determine the level of production x that results in maximum profit.

    c) What unit price p corresponds to maximum profit?

23. You start a company that produces mechanical pencils whose lead does not break while writing. Your total cost consists of a fixed overhead of \$6000 plus production costs of \$5 per pencil.

    a) Find the total cost function $C(x)$, where x is the number of pencils produced.

    b) Sketch the graph of $C(x)$.

24. You're in the cut-throat iPhone case business. You estimate that you can sell a case for \$2 more than it costs to produce it. Your fixed costs are \$11500.

    a) Express total profit $P(x)$ as a function of the level of production x (that is, x represents the number of cases produced).

    b) How much profit (or loss) is generated when 5000 cases are produced?

    c) What is the level of production at the break-even point? (Hint: Recall that the break-even point occurs when $R(x) = C(x)$. Equivalently, it happens when $P(x) = 0$.)

25. Suppose the supply and demand functions are $S(x) = 4x + 200$ and $D(x) = -3x + 480$, respectively. Find the value of x_e for which equilibrium occurs and the corresponding equilibrium price p_e.