1. Solve each of the following inequalities.

   a) $x^3 - 4x \geq 0$ b) $\dfrac{x+2}{x^2-2x} \geq 0$

2. Sketch the graph of each of the following functions given.

   a) $f(x) = x^3 - 4x$ b) $f(x) = x^3 - 5x$ c) $f(x) = x^4 - 4x^2$

3. A straight line passes through points $(a, 0)$ and $(0, b)$, where $a, b \neq 0$. Prove that the line has the following equation:

$$bx + ay = ab$$

4. A bus travels between cities A and B. The distance between these cities is 60 miles. It takes the bus 2 hours to get from A to B. On its way back, the traveling time was only 1.5 hours. Find the average speed of the bus for

   a) the trip from A to B b) the trip from B to A c) for the roundtrip.

5. A bus travels between cities A and B. From A to B, the bus has an average speed of v_1. On its way back, the average speed is v_2. Express the average speed of the bus in terms of v_1 and v_2.

6. An object is moving along a vertical line. The height of the object (measured in meters) is a function of time, measured in seconds. This function is given as $h(t) = -5t^2 + 30t + 200$. Find the average velocity of the object between

   a) $t = 0$ and $t = 2$ b) $t = 3$ and $t = 5$ c) $t = 4$ and $t = 9$

7. An object is moving along a vertical line. The height of the object (measured in meters) is a function of time, measured in seconds. This function is given as $h(t) = -8t + 120$. Find the average velocity of the object between

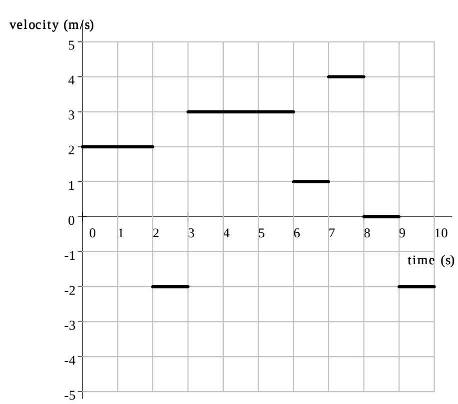
   a) $t = 0$ and $t = 2$ b) $t = 3$ seconds and $t = 5$ c) $t = 4$ seconds and $t = 9$

8. The location of an object, measured in meters, is given by $L(t) = 5t^2 - 3t + 1$, where t is measured in seconds. Find the average velocity of the object between

   a) $t = 2$ and $t = 2.5$ b) $t = 2$ and $t = 2.01$ c) $t = 2$ and $t = 2.001$

9. Given the location function, what is the geometrical meaning of the average velocity computed between times t_1 and t_2?

10. The picture below shows the velocity function, $v(t)$ of an object. (Time is measured in seconds, distance in meters, velocity in $\dfrac{\text{m}}{\text{s}}$. Positive direction is upward.).



How far is the object from the starting point at

a) $t = 1\,\text{s}$? b) $t = 3\,\text{s}$? c) $t = 5\,\text{s}$? d) $t = 10\,\text{s}$

11. Prove that the inverse of a linear function is also linear and the two slopes are reciporcals of each other.

12. Define $f(x) = \dfrac{1}{x^2 - 9}$. Find each of the following limits.

a) $\lim\limits_{x \to -\infty} f(x)$ b) $\lim\limits_{x \to 2^-} f(x)$ c) $\lim\limits_{x \to 2^+} f(x)$ d) $\lim\limits_{x \to 2} f(x)$ e) $\lim\limits_{x \to -3^-} f(x)$ f) $\lim\limits_{x \to -3^+} f(x)$ g) $\lim\limits_{x \to -3} f(x)$ h) $\lim\limits_{x \to 3^-} f(x)$ i) $\lim\limits_{x \to 3^+} f(x)$ j) $\lim\limits_{x \to 3} f(x)$ k) $\lim\limits_{x \to \infty} f(x)$

13. Sketch the graph of $f(x) = \dfrac{1}{x^2 - 9}$.

14. Define $f(x) = \dfrac{x^2 + 3x}{x^2 - 9}$. Find each of the following limits.

a) $\lim\limits_{x \to -\infty} f(x)$ b) $\lim\limits_{x \to -3^-} f(x)$ c) $\lim\limits_{x \to -3^+} f(x)$ d) $\lim\limits_{x \to -3} f(x)$ e) $\lim\limits_{x \to 0^-} f(x)$ f) $\lim\limits_{x \to 0^+} f(x)$ g) $\lim\limits_{x \to 0} f(x)$ h) $\lim\limits_{x \to 3^-} f(x)$ i) $\lim\limits_{x \to 3^+} f(x)$ j) $\lim\limits_{x \to 3} f(x)$ k) $\lim\limits_{x \to \infty} f(x)$

15. Sketch the graph of $f(x) = \dfrac{x^2 + 3x}{x^2 - 9}$

16. Define $f(x)$ is defined as follows: $f(x) = \begin{cases} 3x - 8 & \text{if } x < 5 \\ -x^2 + 8x & \text{if } x \geq 5 \end{cases}$. Find each of the following limits.

a) $\lim\limits_{x \to 5^-} f(x)$ b) $\lim\limits_{x \to 5^+} f(x)$ c) $\lim\limits_{x \to 5} f(x)$

17. Find each of the following limits.

a) $\lim\limits_{x \to \infty} \dfrac{\sqrt{x}}{\sqrt{x+1} - \sqrt{2x}}$

b) $\lim\limits_{x \to -\infty} \dfrac{\sqrt{x}}{\sqrt{x+1} - \sqrt{2x}}$

c) $\lim\limits_{x \to \infty} x \left(\dfrac{1}{2} - \dfrac{1}{2 - \dfrac{1}{x}} \right)$

d) $\lim\limits_{x \to 6^-} \dfrac{\dfrac{1}{x} - \dfrac{1}{6}}{x - 6}$

e) $\lim\limits_{x \to 6^+} \log_6 (x - 6)$

f) $\lim\limits_{x \to 0} \dfrac{\left(\sqrt{x + 25} - 5\right)^2}{x^2}$

g) $\lim\limits_{x \to -3^-} \dfrac{x^2 - 9}{x^2 - 2x - 15}$

h) $\lim\limits_{x \to 5^-} \dfrac{x^2 - 9}{x^2 - 2x - 15}$

18. A company is introducing a new product. The marketing manager determines that t weeks after an advertising campaign begins, $P(t)$ percent of the potential market is aware of the burners, where

$$P(t) = 75\,\frac{t^2 - 4t + 15}{t^2 - 4t + 45} + 11$$

a) What percent of the potential market knows when the campaign begins?

b) What percent of the potential market knows about the product after 5 weeks?

c) What happens to the percentage $P(t)$ in the long run?