1. State the definition of the derivative of a function f(x) at x = a.

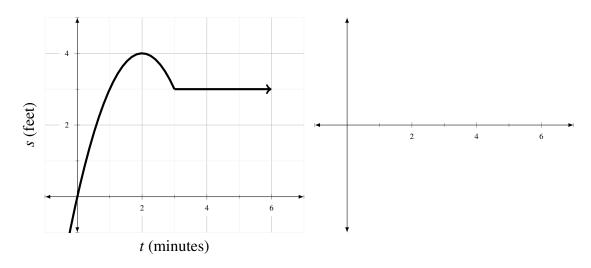
- **2.** Let $f(x) = 5x^2 3x$.
 - (a) Use the **definition** to find the derivative of f(x).

(b) Find the slope of the tangent line to f(x) when x = -3.

(c) Write the equation of the line tangent to f(x) when x = -3.

- **3.** Suppose *N* represents the number of people in the United States who travel by car to another state for a vacation this Memorial Day weekend when the average price of gasoline is *p* dollars per gallon.
 - (a) What are the units of N'(p)?
 - (b) In the context of the problem, write a sentence interpreting N'(p).
 - (c) Would you expect N'(p) to be positive or negative? Explain your answer.

4. The graph of f(x) is sketched below. On the separate set of axes, give a rough sketch of f'(x).



5. Find the domain of each function.

(a)
$$f(x) = \sqrt{x^2 - x - 6}$$

(b)
$$g(t) = \ln(t+6)$$

- **6.** State the definition of "The function f(x) is continuous at x = a".
- 7. Suppose

$$f(x) = \begin{cases} -\frac{2}{x} & x < 2\\ \frac{x}{x-3} & x \ge 2 \end{cases}$$

Is f(x) continuous at x = 0? At x = 2? Justify your answers using the definition of continuity.

8. Find the limit or show that it does not exist. *Make sure you are writing your mathematics correctly and clearly.*

(a)
$$\lim_{x\to\infty} \frac{10^x - 1}{3 - 10^x}$$

(b)
$$\lim_{x \to \infty} \frac{\sqrt[3]{8x^3 + 1}}{2 - 5x}$$

(c)
$$\lim_{r \to 16^-} \frac{\sqrt{r}}{(r-16)^3}$$

(d)
$$\lim_{x \to -3} \frac{x^2 - 9}{x^2 + 2x - 3}$$

- 9. Consider a function with vertical asymptotes at x = -1 and x = 3 and a horizontal asymptote at y = 4/3.
 - (a) Write a formula for such a function.
 - **(b)** Sketch the graph of the function.
 - (c) Use limits to demonstrate that your function really does have a vertical asymptote at x = -1
 - (d) Use limits to demonstrate that your function really does have a horizontal asymptote at y = 4/3.

10. Solve for *x*.

(a)
$$e^{x-3} + 2 = 6$$

(c)
$$\ln x + \ln(x - 1) = 0$$

(b)
$$ln(x+5) - 3 = 7$$

(d)
$$\cos(8x) = 0$$

11. Use the Intermediate Value Theorem to show $\ln x = x - 5$ has a solution. (Hint: Show there is a solution in the interval $[1, e^5]$.)

12. Sketch each of the functions below. Label all *x*- and *y*-intercepts and asymptotes. State, in interval notation, the domain and range of each function next to its graph.

(a)
$$y = 6 - x^4$$

(d)
$$y = \tan^{-1} x$$

(g)
$$y = -2/(x+3)$$

(b)
$$y = \sin(2x)$$

(e)
$$y = e^{x-1} + 2$$

(h)
$$y = \sqrt{x+5}$$

(c)
$$y = \tan x$$

(f)
$$y = \ln x$$