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

2. Let $f(x) = 2x - \frac{2}{x}$.

   (a) Use the definition to find the derivative of $f'(a)$.

   (b) (Your answer to part (a) should have been$f'(a) = 2 + \frac{2}{a^2}$. Find the slope of the tangent line to $f(x)$ when $x = -1$.

   (c) Write the equation of the line tangent to $f(x)$ when $x = -1$.

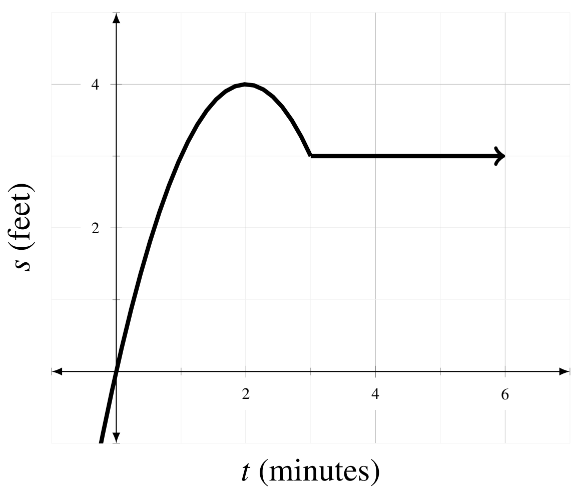
3. Suppose N represents the number of people in the United States who travel by car to another state for a vacation this Memorial Day weekend when the average price of gasoline is p dollars per gallon.

   (a) What are the units of dN/dp?

   (b) In the context of the problem, write a sentence interpreting $\frac{dN}{dp}$.

   (c) Would you expect dN/dp to be positive or negative? Explain your answer.

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



5. Find the domain of each function. Write your answer in interval notation.

   (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

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

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

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

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

9. (a) Write a formula for a function with a horizontal asymptote at $y = 4/3$ and a vertical asymptote at $x = 5$.

   (b) Sketch the graph of your function from part(a).

   (c) Use limits to demonstrate that your function really does have a vertical asymptote at $x = 5$

   (d) Use limits to demonstrate that your function really does have a horizontal asymptote at $y = 4/3$.

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