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

2. Let $f(x) = 5x^2 - 3x$.

1. Use the definition to find the derivative of $f(x)$.

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

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

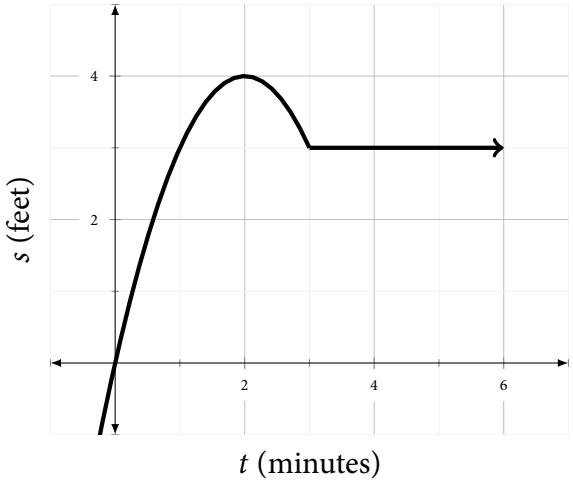
3. Suppose N represents the number of people in the United States who travel by car to another state for a vacation this Memorial Day weekend when the average price of gasoline is p dollars per gallon.

1. What are the units of dN/dp?

2. In the context of the problem, interpret $\frac{dN}{dp}$.

3. 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.

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

2. $g(t) = \ln(t + 6)$

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.*

1. $\lim_{x \to \infty} \frac{10^x - 1}{3 - 10^x}$

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

9. Write the formula for a function with vertical asymptotes at $x = -1$ and $x = 3$ and a horizontal asymptote at $y = 4/3$.

10. Sketch the graph of the function from problem *7*.

11. Solve for x.

1. $e^{x-3} + 2 = 6$
2. $\ln(x+5) - 3 = 7$
3. $\ln x + \ln(x-1) = 0$
4. $\cos(8x) = 0$

12.

1. What does the Intermediate Value Theorem say? You may want to include a picture with your explanation.

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

13.

1. What does the Squeeze Theorem say? You may want to include a picture with your explanation.

14. Use the Squeeze Theorem to show $\lim_{x\to\infty} \dfrac{\cos(2x)}{3x^2} = 0$.

15. 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.

1. $y = 6 - x^4$
2. $y = \sin(2x)$
3. $y = \tan x$
4. $y = \tan^{-1} x$
5. $y = e^{x-1} + 2$
6. $y = \ln x$
7. $y = -2/(x+3)$
8. $y = \sqrt{x+5}$