Name _____ Test 1, Fall 2019

Part 1: Computational Skills

1) Find the limit below. (4 points)

$\lim_{x \to 4} 3x + 7$

2) Find the limit below. (4 points)

$\lim_{x \to 4} \sqrt{2x + 1}$

3) Find the limit below. (4 points)

$\lim_{x \to 4} \frac{x^2 - 16}{x - 4}$

4) Find the limit below. (4 points)

$$\lim_{x \to 4} \frac{x^2 - 3x - 4}{x - 4}$$

5) Find the limit below. (4 points)

$$\lim_{x \to 4^-} \frac{1}{x - 4}$$

6) Find the limit below. (4 points)

$$\lim_{x \to 4^+} \frac{x(x + 6)}{(x - 2)(x - 4)}$$

7) Find derivative of the function below. (6 points)

$f(x) = x^2t^5$

8) Find derivative of the function below. (6 points)

$f(t) = x^2t^5$

9) Find derivative of the function below. (4 points)

$f(x) = 2x^2 + 3x + 1$

10) Find derivative of the function below. (4 points)

$f(x) = 3e^x$

11) Find derivative of the function below. (4 points)

$f(x) = 7^x$

12) Find derivative of the function below. (6 points)

$$f(x) = \frac{x^2 + 2x + 1}{x^3 + 5x + 2}$$

13) Find derivative of the function below. (6 points)

$$f(x) = (x^2 + 2x + 1)(x^3 + 5x + 2)$$

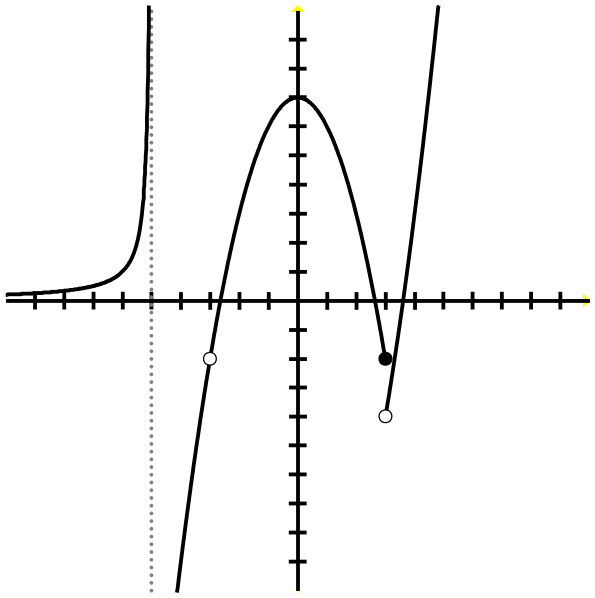
Part 2: Conceptual Understanding

Use the graph for the problems on this page.

14) Estimate each of the following limits. (6 points)

$\lim_{x \to -3^+} f(x) =$

$\lim_{x \to -5^-} f(x) =$



15) Identify two discontinuities and the type of discontinuity. (2 points)

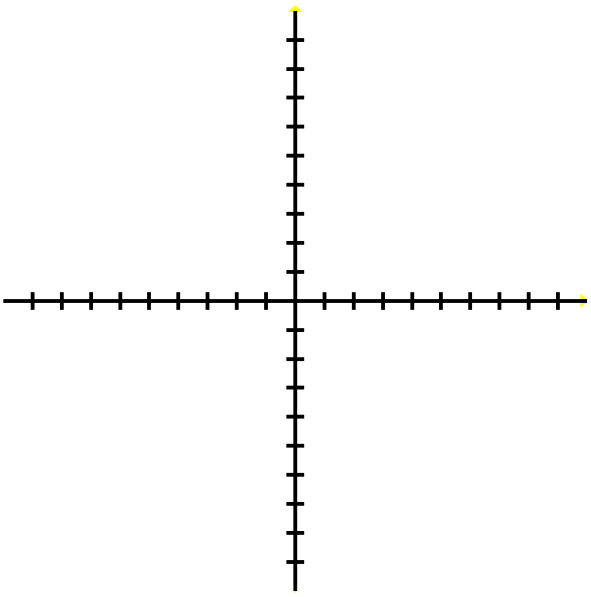
16) Estimate each of the following derivatives. (6 points)

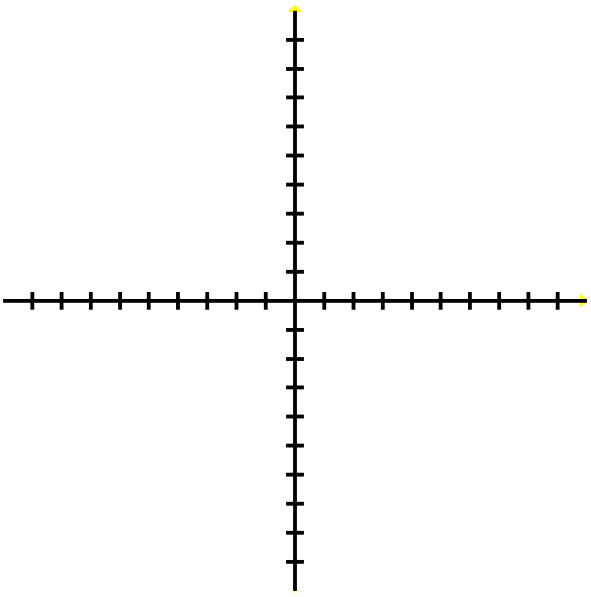
$f'(0) =$

$f'(2) =$

17) On the axes below to the RIGHT, construct a function that is continuous everywhere, but not differentiable at the position $x = 5$. (4 points)

18) On the axes below to the LEFT, construct a function that is defined everywhere, but does not have a limit at the position $x = 5$. (4 points)





19) Below is a table of values of a function $f(x)$. Use it to estimate $f'(2)$. (6 points)

x	$f(x)$
0	2
1	3
2	5
3	8
4	11
5	15

Part 3: Applications

20) The equation $2y' + y = x$ is called a differential equation because it involves an unknown function y, and its derivative y'. This type of equation is often used in engineering and physics. Find constants a and b such that the function $y = ax + b$ satisfies the equation given. (6 points)

21) The position of a beetle is given by $p(t) = 4t^2 + 3t + 1$. Here t is measured in seconds and p is measured in feet. How fast is the beetle moving after 2 seconds? (6 points)