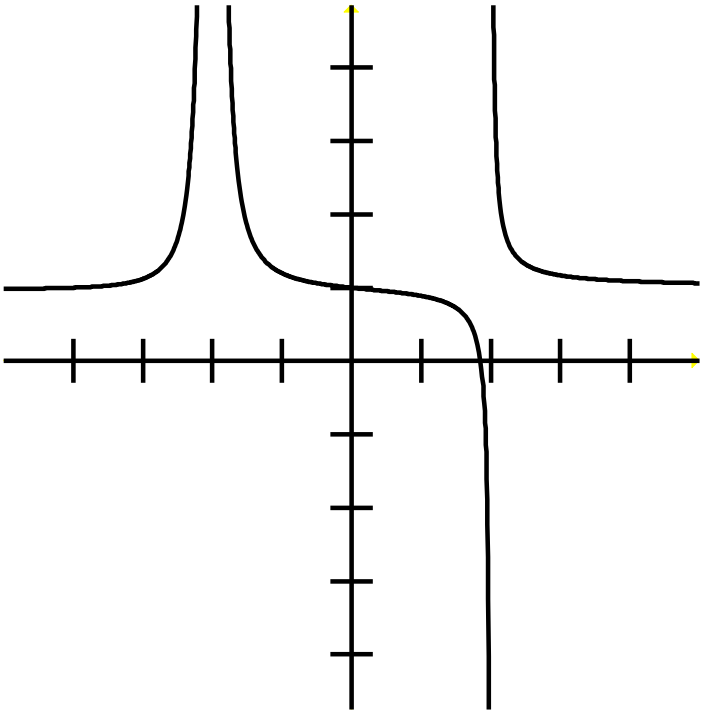
Name _____ Test 1, Spring 2018

1) Using the graph below, find the following limits.
(2 points each)

$\lim_{x\to -2} f(x) =$



$\lim_{x\to 2^-} f(x) =$

$\lim_{x\to 2^+} f(x) =$

$\lim_{x\to 2} f(x) =$

$\lim_{x\to 0} f(x) =$

$\lim_{x\to \infty} f(x) =$

2) Find the limit below. (4 points)

$$\lim_{x\to 3^+} \frac{(x-2)(x+5)}{(x-4)(x-3)^2}$$

3) Let $r(x)$ be a rational function. That is, a polynomial divided by another polynomial. Use an English sentence to explain when the equation below is true. (4 points)

$$\lim_{x \to a} r(x) = r(a)$$

4) Find the limit below. (4 points)

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

5) Find the limit below. (4 points)

$$\lim_{x \to 4^+} \frac{x^2 - 16}{(4 - x)^2} =$$

6) Find the limit below. (4 points)

$$\lim_{x\to\infty} \frac{c^3}{x^2} =$$

7) Find the limit below. (4 points)

$$\lim_{x\to\infty} \frac{5x^2 - 2x + 3}{3x + 1} =$$

8) Find the limit below. (4 points)

$$\lim_{x\to\infty} \frac{14x^2 + 2x + 1}{\sqrt{x^4 - 2x + 1} + x^2} =$$

9) Is the function below continuous? Why or why not? (4 points)

$$f(x) = \begin{cases} \dfrac{x^2 + x}{x + 1} & \&\text{if } x \neq 1 \\ 2 & \&\text{if } x = 1 \end{cases}$$

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

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

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

$$f(x) = (2x^7 + 4)(3x^4 - 2x^2)$$

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

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

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

$$f(x) = \cos(2x)$$

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

$$f(x) = 3^{2x}$$

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

$$f(x) = e^4$$

16) In the theory of calculus, one of the statements below is true. Which one is it? (2 points)
(No work required)

A) “Limits are used to define derivatives”
B) “Derivatives are used to define limits”

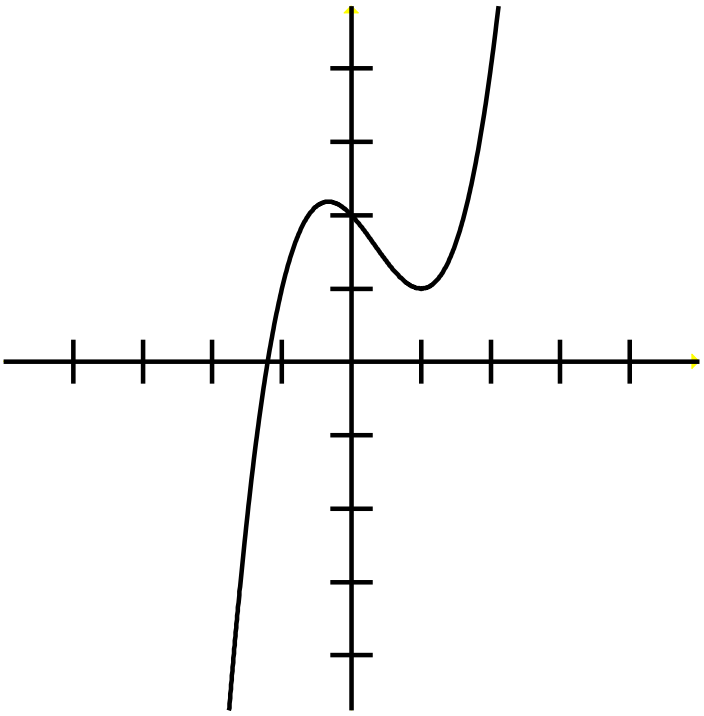
17) Using the graph below, estimate the following derivatives. (2 points each)

$f'(-1) =$

$f'(0) =$

$f'(1) =$

$f'(2) =$



18) The position of a fly from a tree is given by $f(t) = 2t^2 - 9t + 12$ where t is measured in seconds and f is measured in feet. When is the fly motionless? (6 points)

19) A table of values is given below for a function $f(x)$. Using this table, estimate the derivative at $x = 3$.
(The better the approximation the more points you score. There are multiple answers that yield full credit)
(6 points)

x	$f(x)$
1	5
2	12
3	20
4	25
5	29

20) It is known that the derivative of $y = 3x^2$ is $y' = 6x$. Use the formal definition of the derivative to show this. OR for half credit correctly state the formal definition of the derivative using a limit.
(6 points)

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

$$f(x) = \tan^3((3x+1)^5)$$