

Name _____ Calculus I, Test 2, Fall 2016

Non-calculator portion. Please show all your work and circle your answer when appropriate. You do not need to simplify answers unless the problem specifies to do so.

1) Find the derivative of $f(x) = \frac{x^3 - x}{x}$. (4 points)

2) Find the derivative of $f(x) = e^3$. (4 points)

3) Find the derivative of $f(x) = 2^{\sin(x)}$. (4 points)

4) Find the second derivative of $f(x) = x^5 + 6x^2 + 7$. (4 points)

5) Find the 12th derivative of $f(x) = e^{2x}$. (4 points)

6) Find the derivative of $f(x) = \cos^3(x)$. (4 points)

7) Find the derivative of $f(x) = x^5 \tan(x)$. (4 points)

8) Given the function $f(x) = \frac{x^2}{3x}$, find $f'(5)$. (4 points)

9) An object is moving horizontally. The position, in feet, after t seconds is given by the function $f(x) = 2t^2 - 6t + 18$ for $0 \leq t \leq 30$.

(a) Determine the velocity function of the object. (4 points)

(b) When is the velocity of the object 14 feet per second? (2 points)

10) Find the following: (4 points)

$$\frac{d}{dx} e^{e^x}$$

11) Find the derivative of $f(x) = (2x^6 - 3x^3 + 3)^{25}$. (4 points)

12) Use calculus to find the vertex of the parabola $y = x^2 - 6x + 18$. (4 points)

13) Given $x^2 + y^3 = 5x$, find $\frac{dy}{dx}$. (4 points)

14) Given $x^2 + y^3 = 5x$, find $\frac{dx}{dy}$. (4 points)

15) Find the derivative of $f(x) = \tan^{-1}(e^{4x})$. (4 points)

16) Use the graph of $y = f(x)$ below to estimate each of the following. (2 points each)

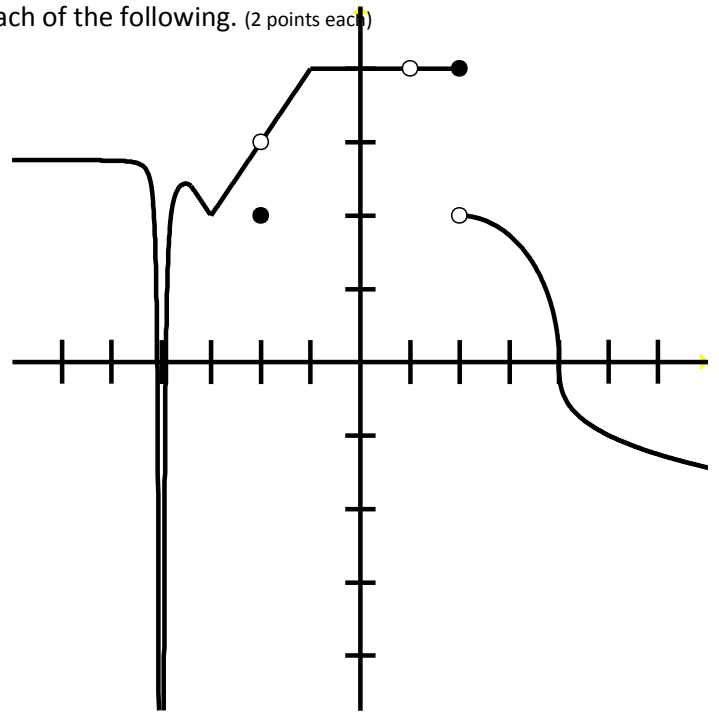
a) $f'(-6)$

b) $f'(-3)$

c) $f'(-1.5)$

d) $f'(3.999)$

e) $f''(3)$



f) The x -value of an inflection point.

g) The absolute maximum of $f(x)$.

h) A maximizer corresponding to the previous answer.

i) A relative minimum of $f(x)$ that is not the absolute maximum.

j) The minimizer corresponding to the previous answer.

k) An interval where $f(x)$ is increasing.

l) An interval where $f(x)$ is concave up.

Technology portion: After you tear off and turn in the non-calculator portion, you may take out your technology and finish this portion. Again, please circle your answer.

17) A 90-inch square has two bugs on it. In clockwise order, the corners are labelled A , B , C , and D . One bug is located on corner A and the other is on corner B . At exactly 2:30 today, the bug on corner B will start walking to corner A at 20 in/min. At this same time the bug at corner A will also start walking toward corner D at 18 in/min.

How fast is the distance between the two bugs changing at 2:32? (6 points)

18) A water tank has is shaped like an upside down cone. It's radius is 4 feet wide and it has a height of 8 feet. It's supposed to hold water, but actually there's a small hole in the bottom. Water is draining out at a rate of $2 \text{ ft}^3/\text{min}$. How quickly is the water level dropping when the water is 3 feet deep? (8 points)