MAC2311
Ref. #:__829232____
Term: Spring 2015 (2014_2)
Exam #4

Name_____ Grade_____

Student ID_____ Date_____

SHORT ANSWER. Show ALL work NEATLY in the space provided, and write the final answer on the answer line. No credit will be given if work is not shown or is not legible.

Use l'Hôpital's rule to find the limit.

1) $\lim_{x \to \infty} \frac{8x^2 - 5x + 1}{6x^2 + 3x - 8}$ 1) _____

Provide an appropriate response.

2) Suppose that $f'(x) = 2x$ for all x. Find the function $f(x)$ if $f(-2) = 2$. Find $f(3)$. 2) _____

Use l'Hopital's Rule to evaluate the limit.

3) $\lim_{x \to 0} \frac{\sin 5x}{\sin x}$

3) _____

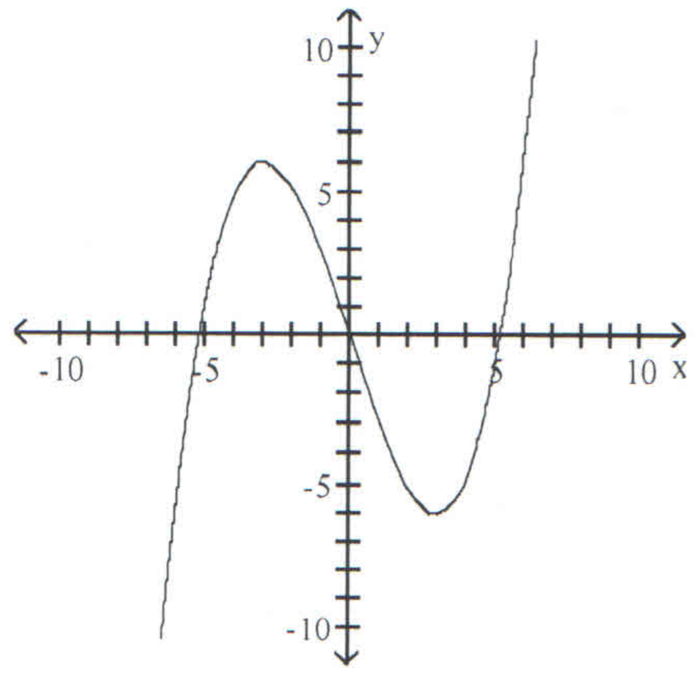
Given the acceleration a, the initial velocity, and initial position of a body moving along a coordinate line, find the body's position at time t.

4) $a(t) = -9\sin 3t$ $\quad v(0) = 5$ $\quad s(0) = -5$

4) _____

Use the graph of the function f(x) to locate the local extrema and identify the intervals where the function is concave up and concave down. Show all your work.

5)



5) _____

Provide an appropriate response.

6) Find the error in the following incorrect application of L'Hôpital's Rule.

6) _____

$$\lim_{x \to 0} \frac{\sin x}{x + x^2} = \lim_{x \to 0} \frac{\cos x}{1 + 2x} = \lim_{x \to 0} \frac{-\sin x}{2} = 0.$$

Find the extreme values of the function and where they occur.

7) $y = \dfrac{x + 1}{x^2 + 2x + 2}$ 7) _____

Find the function with the given derivative whose graph passes through the point P.

8) $r'(t) = \sec^2 t - 4$, $P(0, -5)$ 8) _____

Find the limit.

9) $\lim\limits_{x \to \infty} (\ln x)^{4/x}$ 9) _____

Use l'Hopital's Rule to evaluate the limit.

10) $\lim_{x \to 0} \frac{\tan 2x}{\ln(1+x)}$ 10) _____

Find the extreme values of the function and where they occur.

11) $y = x^2 e^x$ 11) _____

Use l'Hopital's Rule to evaluate the limit.

12) $\lim_{x \to 0} (\ln(x+\tan x) - \ln(\sin x))$ 12) _____

Find the function with the given derivative whose graph passes through the point P.

13) $f'(x) = e^{2x}$, $P\left(0, \frac{5}{2}\right)$ 13) _____

Use l'Hopital's Rule to evaluate the limit.

14) $\lim_{x \to 0} \frac{x7^x}{7^x - 3}$ 14) _____

Provide an appropriate response.

15) Determine the values of constants a and b so that $f(x) = ax^2 + bx$ has an absolute maximum at the point (2, 4). 15) _____

Answer the questions below, then graph the function (10 points). <u>Show all work and explain</u>.

16) $y = x^3 - 3x + 3$

16) _____

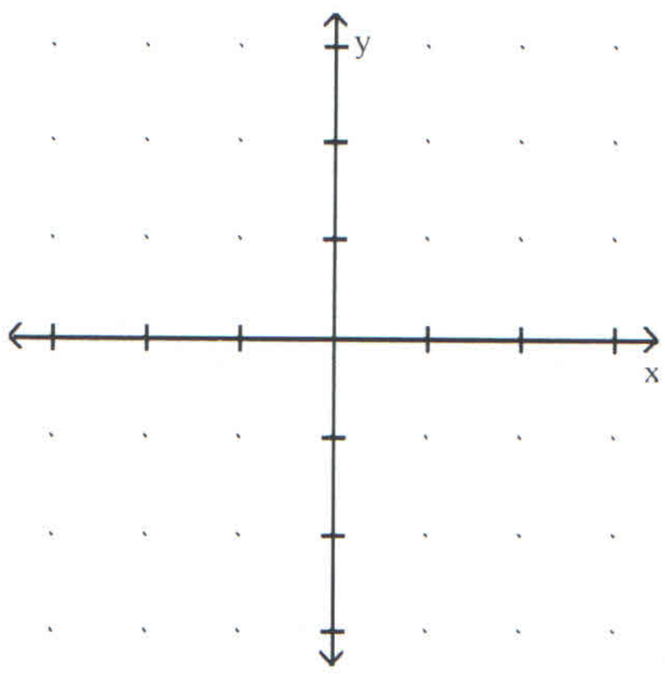
a) Identify where the extrema of *f* occur

b) Find the intervals where *f* is increasing or and where *f* is decreasing

c) Find where the graph of *f* is concave up and where it is concave down

d) Plot all specific points: local maxima and minima, points of inflection, and intercepts.

e) Graph the equation



L'Hopital's rule does not help with the given limit. Find the limit some other way.

17) $\lim_{x \to 0} \frac{\sec x}{\csc x}$ 17) _____

Solve the problem.

18) From a thin piece of cardboard 6 in. by 6 in., square corners are cut out so that the sides can be folded up to make a box. What dimensions will yield a box of maximum volume? What is the maximum volume? Round to the nearest tenth, if necessary. 18) _____

L'Hopital's rule does not help with the given limit. Find the limit some other way.

19) $\lim_{x \to 0^+} \frac{\tan x}{\sec x}$

19) _____

Find the limit.

20) $\lim_{x \to \infty} \frac{\log_7(2x+1)}{\log_4(x-7)}$

20) _____

L'Hopital's rule does not help with the given limit. Find the limit some other way (Extra Credit – 5 points).

21) $\lim_{x \to 0} \frac{x \cot x}{\cos x}$

21) _____

1) $\frac{4}{3}$

2) 2

3) 5

4) -2

5) Local minimum at $x = 3$; local maximum at $x = -3$; concave up on $(0, \infty)$; concave down on $(-\infty, 0)$

6) L'Hôpital's Rule cannot be applied to $\lim_{x \to 0} \frac{\cos x}{1 + 2x}$ because it corresponds to $\frac{1}{1}$ which is not an indeterminate form.

7) The maximum is $\frac{1}{2}$ at $x = 0$; the minimum is $-\frac{1}{2}$ at $x = -2$.

8) $r(t) = \tan t - 4t$

9) 1

10) -18

11) Minimum value is 0 at $x = 0$; no maximum value.

12) 1

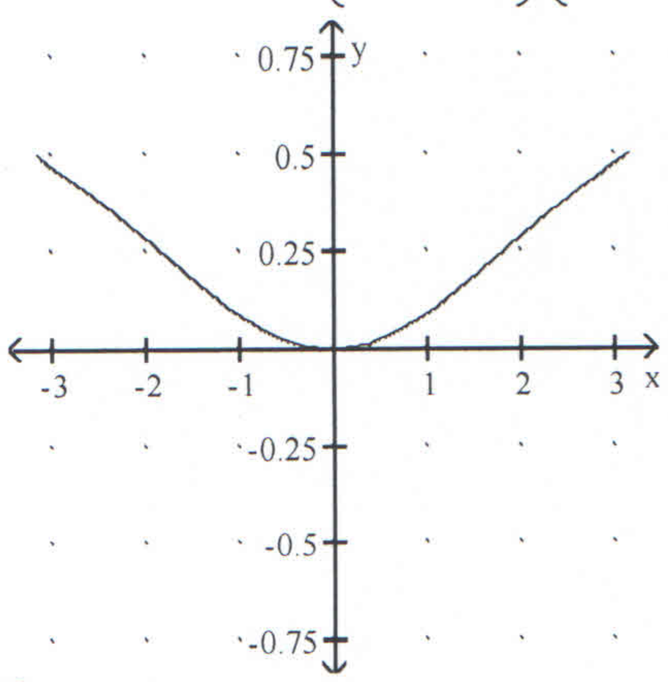
13) $f(x) = \frac{1}{2} e^{2x} + 2$

14) 18

15) $a = -1, b = 4$

16) local minimum: (0, 0)

inflection points: $\left(-\frac{\sqrt{30}}{3}, \frac{1}{4}\right), \left(\frac{\sqrt{30}}{3}, \frac{1}{4}\right)$



17) 0

18) 6.7 in. × 6.7 in. × 1.7 in.; 74.1 in^3

19) 0

20) 0

21) 1