_____ / 58 total points

Test #2

Name: _____

Math 140, Prof. Beydler

Wednesday, October 26, 2016

Directions: Show all work. No books or notes. A **scientific calculator** is allowed. Your desk and lap must be clear (no phones, notebooks, etc.). Write your answers in the indicated places, or box your answers. Good luck!

1. (4 points) Find the intervals of increase and decrease for the following function.

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

Increasing: _____

Decreasing: _____

2. (6 points) Determine where the graph of the given function is concave upward and concave downward. Also, find the coordinates of any inflection point(s).

$f(x) = 3 + \sqrt[3]{x}$

Concave up: _____

Concave down: _____

Inflection point(s): _____

3. For the function $f(x) = x + \frac{1}{x}$ do the following. Note: there aren't any x-intercepts, y-intercept, or horizontal asymptotes.

a. (1 point) Find the vertical asymptote of f.

vertical asymptote: _____

b. (4 points) Find $f'(x)$ and $f''(x)$, and determine where each are 0 or do not exist (DNE).

$f'(x) = 0$ when $x =$ _____

$f'(x)$ DNE when $x =$ _____

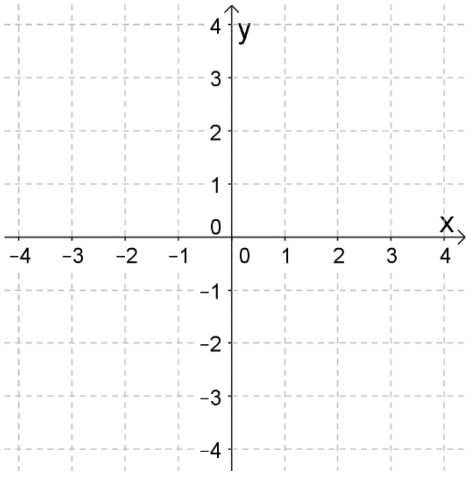
$f''(x) = 0$ when $x =$ _____

$f''(x)$ DNE when $x =$ _____

c. (2 points) Do a sign analysis on f' and f''.

d. (2 points) Find any relative maxima and minima, as well as any inflection points.

e. (2 points) Sketch the graph of f.



4. (4 points) Find the absolute maximum and absolute minimum (if any) of $f(x) = 3x^5 - 5x^3$ on the interval $-2 \leq x \leq 0$.

Absolute maximum: _____

Absolute minimum: _____

5. (4 points) Given the price $p(q) = 37 - 2q$ and the total cost $C(q) = 3q^2 + 5q + 75$, determine the level of production q where the profit $P(q)$ is maximized.

Level of production, $q =$ _____

6. (4 points) It is estimated that the cost of constructing an office building that is n floors high is $C(n) = 2n^2 + 700n + 200$ thousand dollars. How many floors should the building have to minimize the average cost per floor? (Be sure your answer is a whole number.)

Answer: _____

7. (2 points) Differentiate. Be sure to simplify your answer.
$f(x) = x \ln x^2$

$f'(x) =$ _____

8. (2 points) Differentiate. Don't worry about simplifying.
$f(x) = 3^{5x+2}$

$f'(x) =$ _____

9. (2 points) Differentiate. Don't worry about simplifying.

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

$f'(x) =$ _____

10. (3 points) Differentiate. Don't worry about simplifying.

$f(x) = \sqrt{e^{2x} + \ln(x^2 + 1)}$

$f'(x) =$ _____

11. (5 points) Use **logarithmic differentiation** to find the derivative of the following function.

$f(x) = \frac{e^{-3x}\sqrt{2x-5}}{(6-5x)^4}$

$f'(x) =$ _____

12. For the function $f(x) = 4xe^x$, do the following:

a. (1 point) Find the domain of f.

Domain: _____

b. (1 point) Find any x-intercept(s) and the y-intercept of f.

x-intercept(s): _____

y-intercept: _____

c. (4 points) Find $f'(x)$ and $f''(x)$, and determine where each are 0 or do not exist (DNE).

$f'(x) = 0$ when $x =$ _____

$f'(x)$ DNE when $x =$ _____

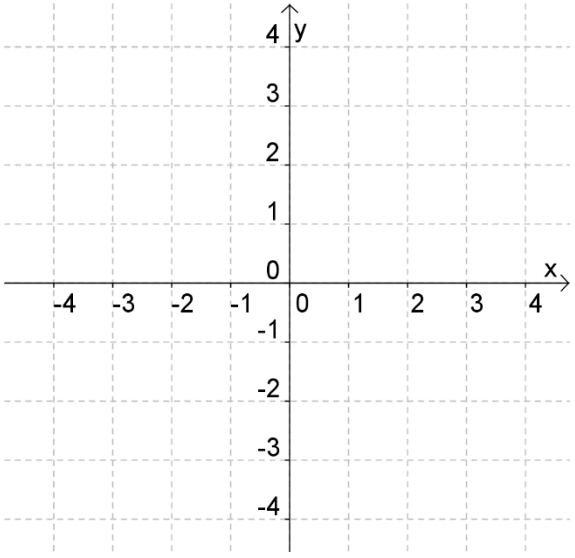
$f''(x) = 0$ when $x =$ _____

$f''(x)$ DNE when $x =$ _____

d. (2 points) Do a sign analysis on f' and f''.

e. (1 point) Find any relative maxima and minima, as well as any inflection points (round any decimals to 2 places).

f. (2 points) Sketch the graph of f. There are no vertical asymptotes, but there is a horizontal asymptote $y = 0$.



Note: Be sure to double check your work. And don't forget to turn in your homework! ☺