

Name _____ MA135 Midterm #2 November 13, 2014

Be sure to show all of your work. All solutions should use calculus techniques from this course. Unsupported answers will receive no credit! Calculators are not allowed on this exam. You may only use the formula sheet and scratch paper supplied with this exam. Good Luck!!

Problem No.	Pts Possible	Points
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
Total	100	

1. If $f(x) = \frac{1}{x}$, find the number c promised by the Mean Value Theorem on the interval $[1, 3]$. Don't forget to check the hypotheses of the MVT!

c =	
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2. Find the equation of the tangent line to the curve $x^2y^2 = x^2 + 2y^2 + 14$ at $(2, 3)$.

Equation:	
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3a.

$$d\left(\frac{\tan 2x}{3x}\right) =$$

3b. If the cost of manufacturing q units of a product is $C(q) = 3q^2 + q + 300$, use marginal analysis to estimate the cost of producing the 17th item.

Cost =	
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4. a. Find $\lim_{x \rightarrow \infty} \frac{e^{-2x} - 2}{e^{-3x} + 7} \cdot \lim_{x \rightarrow \infty} \frac{e^{-2x} - 2}{e^{-3x} + 7} =$

b. Find $\lim_{x \rightarrow -\infty} \frac{e^{-2x} - 2}{e^{-3x} + 7} \cdot \lim_{x \rightarrow -\infty} \frac{e^{-2x} - 2}{e^{-3x} + 7} =$

5. Find the absolute maximum and minimum of the function $f(x) = \frac{4x}{x^2 + 4}$ on the interval $[1, 10]$. Please give both x and y values.

Absolute maximum:	
Absolute minimum:	

6. The function $f(x) = (2x - 1)e^{4x}$ has $f'(x) = (8x - 2)e^{4x}$ and $f''(x) = 32xe^{4x}$. Find the intervals where f is increasing and decreasing and concave up and concave down. Find the x -coordinates of all relative extrema.

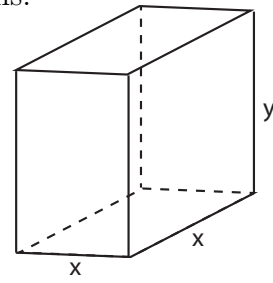
Increasing:	
Decreasing:	
Concave up:	
Concave down:	
Relative Maxima:	
Relative Minima:	

7. At noon, a flatbed truck leaves Winslow, Arizona, traveling north at 65 miles per hour. At 2 pm, a Volkswagen bus leaves the same corner traveling west at 60 miles per hour. How fast is the distance between the two vehicles changing at 5 pm? You do not need to multiply out any big numbers.

Rate =	
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8. A rectangular parcel has a square base of side x and a third side of length y . Postal regulations say that the perimeter of the square plus the length of side y cannot exceed 102. Find the volume of the largest parcel allowed by these regulations.

Volume =	
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9. Let $f(x) = \frac{2x + 5}{4x + 2}$. Find intervals where f is increasing and decreasing, and concave up and concave down. Find all horizontal and vertical asymptotes and find all relative maxima, minima, and inflections. Sketch the graph for 1 pt extra credit.

Intervals where increasing:	
Intervals where decreasing:	
Intervals where concave up:	
Intervals where concave down:	
Horizontal asymptotes:	
Vertical asymptotes:	
Inflections:	
Relative maxima:	
Relative minima:	

10a. If $y = (\cos x)^{\sin x}$, find y' .

$y' =$	
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10b. Use linear approximation or differentials to estimate $\sqrt{3.97}$.