

Math 180
Winter, 2008

Name _____

Exam 3
No Calculator!
No Notes!

1. Evaluate each integral.

a) $\int \cos x \sin(\sin x) dx$

b) $\int \frac{x}{\sqrt{4-x^2}} dx$

c) $\int \frac{x}{\sqrt{1-x^4}} dx$

d) $\int \frac{\ln x}{x} dx$

e) $\int \sec(4x)\tan(4x)dx$

f) $\int \frac{e^{\arctan x}}{1+x^2} dx$

Exam 3
No work = no credit!

1. Let $f(x) = \frac{3x}{\sqrt{x^2 + 9}}$.

Domain _____

Range _____

Symmetry _____

Intercepts _____

Horizontal Asymptotes _____

Local Min(s) _____

Critical points _____

Local Max(s) _____

Inflection points _____

Intervals where graph of f is increasing _____

Intervals where graph of f is decreasing _____

Intervals where graph of f is concave up _____

Intervals where graph of f is concave down _____

f'

f''

Sketch the graph. Remember show your work on scratch paper. Use limits for asymptotes.

2. Use the Fundamental Theorem of Calculus, Part I to find the derivative of

$$y = \int_1^{\arccos x} \cos(t^2) dt$$

3. Use the Mean Value Theorem to find the value of c guaranteed for

$$f(x) = \frac{x+1}{x} \quad \left[\frac{1}{2}, 2 \right].$$

4. Four feet of wire is to be used to form a square and a circle. How much of the wire should be used for the square and how much should be used for the circle to enclose the minimum total area?

5. Consider the function $f(x) = 3 - |x - 4|$ on the interval $[1, 7]$. Note that $f(1) = f(7)$, but that $f'(x) \neq 0$ for any x in the interval $[1, 7]$. Explain why this does not contradict Rolle's Theorem.

6. Find each limit. Use L'Hopital's Rule if necessary.

a) $\lim_{x \rightarrow \infty} e^{-x} \sqrt{x}$

b) $\lim_{x \rightarrow 1^+} \left(\frac{1}{\ln x} - \frac{1}{x-1} \right)$

c) $\lim_{x \rightarrow 0^+} (\sin x)^x$

7. A right triangle in the first quadrant has the coordinate axes as sides, and the hypotenuse passes through the point $(1, 8)$. Find the vertices of the triangle such that the length of the hypotenuse is minimum.

8. Assume that f is differentiable for all x . The sign of f' is as follows:

$$f'(x) > 0 \text{ on } (-\infty, -4)$$

$$f'(x) < 0 \text{ on } (-4, 6)$$

$$f'(x) > 0 \text{ on } (6, \infty)$$

Supply the appropriate inequality for the indicated value of c .

a) $g(x) = f(x) + 5$ $g'(0)$ _____ 0

b) $g(x) = -f(x)$ $g'(0)$ _____ 0

c) $g(x) = f(x - 10)$ $g'(8)$ _____ 0

d) $g(x) = 3f(x) - 3$ $g'(-5)$ _____ 0

e) $g(x) = -f(x)$ $g'(-6)$ _____ 0