Math 21 Exam II November 8, 2005

Name _____

Section _____

Grading

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10. _____

Total _____

This is a closed book exam. No books, notes or other aids may be used.

Cell phones must be off. Cell phones, calculators, books, notes etc that are out during the exam can be considered cheating.

Unless otherwise indicated, explain your answers for full credit. You will not get full credit for a problem without appropriate explanation of your work. A correct answer alone is not enough.

Point values for the problems are indicated as [*]

1: [25] Determine the following derivatives:

(a) $\dfrac{d}{dx}\left(\dfrac{6}{\sqrt[3]{x^5}}+(2x^3+7x)^9-\dfrac{2}{8x-9}\right)$ **(b)** $\dfrac{d}{dx}\left((xe^{x^2}+7)^{19}\right)$ **(c)** $\dfrac{d}{dx}\left(\ln(\sin(x^3))\right)$

(d) $\dfrac{d}{d\theta}\left(\dfrac{\mu W}{\mu\sin\theta+\cos\theta}\right)$ **(e)** $\dfrac{d}{dx}\left(\dfrac{1}{\sigma\sqrt{2\pi}}e^{\frac{-(x-\mu)^2}{2\sigma^2}}\right)$

2: [10] If $H=t\sqrt{s}+\dfrac{t^2}{\sqrt{s}}$, find $\dfrac{d^2H}{ds^2}$ and $\dfrac{d^2H}{dt^2}$.

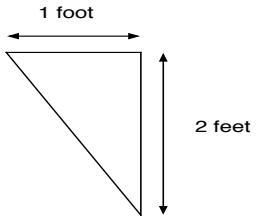
3: [7] If $g(x)=e^x(\ln(f(x)))$ with $f(0)=3$ and $f'(0)=5$, determine $g'(0)$.

4: [8] Find y' in terms of x if $y=x^x$.

5: [8] Use $(\sin x)'=\cos x$, $(\cos x)'=\sin x$ and $\sin^2 x+\cos^2 x=1$ to show that $(\tan x)'=\sec^2 x$.

6: [6] Determine $\lim\limits_{x\to 1}\dfrac{x^a-ax+a-1}{(x-1)^2}=$

7: [9] A sink is 3 feet wide and a cross section looking at the end has the shape of a right triangle 2 feet high and 1 foot deep as shown in the figure below. If water is filling the sink at a rate of $20in^3/s$ (this is approximately 5 gallons per minute) how fast is the water rising when the depth is 8 inches?



8: [8] Find the absolute maximum and absolute minimum of $f(x)=k(a-r)r^2$ on the interval $a/2\le r\le a$ where a and k are given constants.

9: [6] Sketch the graph of a function that satisfies the following conditions: $f(x)$ has slant asymptote $y=x+1$ and vertical asymptote $x=1$, $f(x)$ is increasing for $x<0$ and $x>3$ and decreasing for $0<x<1$ and $1<x<3$, $f(x)$ is differentiable everywhere except at $x=1$ and $x=2$, $f(x)$ has no inflection points.

10: [13] If $f(x)=x^4+4x^3$ then $f'(x)=4x^3+12x^2$ and $f''(x)=12x^2+24x$.
(a) On which interval(s) is $f(x)$ decreasing?
(b) What are the critical numbers?
(c) For each critical number does it correspond to a local maximum or local minimum or neither? In each case justify your answer with the first or second derivative test.
(d) What are the inflection points?
(e) On which interval(s) is is $f(x)$ concave up?
(f) Sketch $f(x)$.