Name: _____

Instructor: _____

Exam II
October 30, 2001

- The Honor Code is in effect for this examination. All work is to be your own.
- No calculators.
- The exam lasts for one hour.
- Be sure that your name is on every page in case pages become detached.
- Be sure that you have all 10 pages of the test.

Good Luck!

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!

1.	(a)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(e)
3.	(a)	(b)	(c)	(d)	(e)
4.	(a)	(b)	(c)	(d)	(e)
5.	(a)	(b)	(c)	(d)	(e)
6.	(a)	(b)	(c)	(d)	(e)
7.	(a)	(b)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(e)
9.	(a)	(b)	(c)	(d)	(e)
10.	(a)	(b)	(c)	(d)	(e)

DO NOT WRITE IN THIS BOX!

Total multiple choice: _____

11. _____

12. _____

13. _____

14. _____

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Multiple Choice

1.(6 pts.) If $xy^2 + x^2y = \sin(x + y)$ what is y' at the point $(-1, 1)$?

(a) 1 (b) -1 (c) 0 (d) -2 (e) 2

2.(6 pts.) Find $\dfrac{d\ (\tan x\ \sec x)}{dx}$.

(a) $\sec^3 x + \sec x \tan^2 x$ (b) $\sin^3 x - \sin x \cos^2 x$ (c) $\sin^3 x + \sin x \cos^2 x$

(d) $\sec^3 x - \sec x \tan^2 x$ (e) $\sec^2 x + \sec x \tan^3 x$

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3.(6 pts.) If $f'(x) = x^2(x^2-1)(x-2)^3$ find the local minima of f. Note that you are given f', **NOT** f.

(a) 0 (b) -1, 0, 1 and 2 (c) -1 and 2 (d) 0 and 1

(e) Can't tell from the given information.

4.(6 pts.) If $f''(x) = x^2(x^2-1)(x-2)^3$ find the points of inflection of f. Note that you are given f'', **NOT** f.

(a) 0 and 1 (b) 0 (c) -1, 0, 1 and 2 (d) -1, 1 and 2

(e) Can't tell from the given information.

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5.(6 pts.) Find $\dfrac{d\cos\left(\dfrac{x^2}{x^2+1}\right)}{dx}$.

(a) $-\sin\left(\dfrac{x^2}{x^2+1}\right)$

(b) $-\sin\left(\dfrac{2x}{(x^2+1)^2}\right)$

(c) $-\dfrac{2x}{(x^2+1)^2}\cdot\sin\left(\dfrac{x^2}{x^2+1}\right)$

(d) $-\dfrac{2x}{(x^2+1)^2}\cdot\cos\left(\dfrac{x^2}{x^2+1}\right)$

(e) $\cos\left(\dfrac{2x}{(x^2+1)^2}\right)$

6.(6 pts.) Find $\lim\limits_{u\to\infty}\dfrac{(u^2-1)^2}{4u^4-3u^3+2u^2-u}$.

(a) $\dfrac{1}{4}$ (b) $-\dfrac{1}{3}$ (c) $+\infty$ (d) $-\infty$ (e) Does not exist.

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7.(6 pts.) If $y = \dfrac{\sin x}{x}$ find the differential dy.

(a) $\dfrac{\cos x}{x^2}dx$ (b) $\dfrac{x\sin x - \cos x}{x^2}dx$ (c) $\dfrac{\cos x}{x}dx$

(d) $\dfrac{x\cos x - \sin x}{x^2}dx$ (e) $\cos x dx$

8.(6 pts.) If $y = x^3 - 3x^2 + 4x + 1$, find y''.

(a) $4x + 1$ (b) $7x^2 - 3x + 2$ (c) 6

(d) $3x^2 - 6x + 4$ (e) $6x - 6$

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9.(6 pts.) Find $\dfrac{d^{401}\sin x}{dx^{401}}$.

(a) $\sin x$ (b) $-\sin x$ (c) $\cos x + \sin x$ (d) $\cos x$ (e) $-\cos x$

10.(6 pts.) Which number below occurs if you use linear approxiamtion to estimate the relative error in the area of a circle and if you have made a relative error of 5% in measuring the diameter?

(a) 150% (b) 10% (c) 0 (d) 20% (e) 1%

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Partial Credit

You must show your work on the partial credit problems to receive credit!

11.(10 pts.) Find an equation for the tangent line to the curve $x^2 + y = 3\sin(x + y)$ at the point $(1, -1)$. Does the curve lie above or below the tangent line in a neighborhood of the point? Why?

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12.(10 pts.) You are watching an ant hill grow and you want to know how much material the ants are excavating without disturbing them. You observe that the hill is shaped like a cone and you remember that the volume of a cone is $V = \frac{\pi}{3}r^2h$. At a particular moment you observe that the height and the radius are each 2cm. Moreover the radius is increasing at a rate of 4cm/hr and the height is increasing at a rate of 2cm/hr. How fast is the volume increasing at this same moment?

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13.(10 pts.) Show that $\left|\sin(2.674) - \sin(2.670)\right| \leq 0.004$. Also explain why it is that $\sin(2.674) - \sin(2.670) < 0$? (Hint: You may use that $\dfrac{\pi}{2} < 2.670 < 2.674 < \pi$.)

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14.(10 pts.) Sketch the curve $y = \sqrt{x^2+1}$ on the axes below. You may use that $y' = \dfrac{x}{\sqrt{x^2+1}}$ and that $y'' = \dfrac{1}{(x^2+1)^{3/2}}$. Indicate the intervals on which f is increasing/decreasing. If there are no such intervals, say so. Indicate the intervals on which f is concave up/down. If there are no such intervals, say so. Find all the vertical asymptotes. If there are none, say so. Check that the line $y = x$ is a slant asymptote as x goes to $+\infty$. Check that the line $y = -x$ is a slant asymptote as x goes to $-\infty$.

=2.7in p14.eps

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