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) $\sec^2 x + \sec x \tan^3 x$

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.

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 $\displaystyle\lim_{u \to \infty} \dfrac{(u^2 - 1)^2}{4u^4 - 3u^3 + 2u^2 - u}$.

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

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) $6x - 6$

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%

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?

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 $V = \dfrac{\pi}{3}r^2 h$.   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?

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

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 $-\infty$.
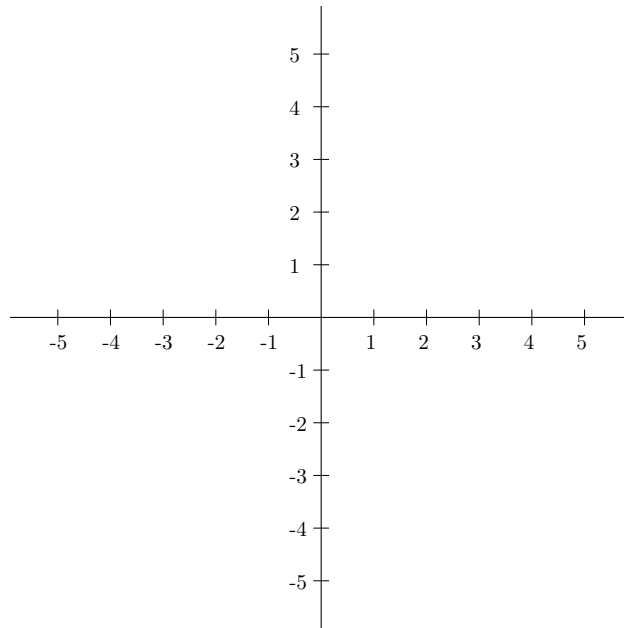
Name: ANSWERS

Instructor: ANSWERS

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

DO NOT WRITE IN THIS BOX!

Total multiple choice: _____

11. _____

12. _____

13. _____

14. _____

Total: _____