Short
too easy

Started to leave @ 32
first page 10 min
2nd @ 20

MATH 131
Test II
November 6, 1992

Name Key

7 left by 35 min 9 @ 40
wed time ~~52~~ 52

median 89

odd Max Min problem

1. Find the following derivative: (10)

$\frac{dy}{dx}$ where $x^3 - xy + \cos y = 3$.

$$3x^2 - \left(x\frac{dy}{dx} + y\right) - \sin y \frac{dy}{dx} = 0$$

$$(-x - \sin y)\frac{dy}{dx} = -3x^2 + y$$

$$\frac{dy}{dx} = \frac{-3x^2 + y}{-x - \sin y} \text{ or } \frac{3x^2 - y}{x + \sin y}$$

all close
9
18 all
5 not so good

2. Find the linear approximation L(x) of $f(x) = 1 + \sin x$ at $x = \pi$. (10)

$f'(x) = \cos x$

$f'(\pi) = -1$

$(\pi, 1)$

$y - 1 = -(x - \pi)$

$= -x + \pi$

$y = -x + \pi + 1$

$L(x) = -x + \pi + 1$

15 all
6 close

3. A circle has a radius of approximately 5 in. We know the radius within ±.01 in. What is the approximate error in the area? (8)

$A = \pi r^2$

$\frac{dA}{dr} = 2\pi r$

$dA = 2\pi r\, dr$

$dr = .01 \quad r = 5$

$dA = 2\pi(5)(.01)$

$= (.1)\pi = .314 \text{ in}^2$

20

4. Ohm's law for electrical circuits is $V = IR$, where V is voltage (in volts), I is current (in amps.) and R is resistance (in ohms.) Suppose that the resistance is 10 ohms in our circuit (fixed). If the voltage is decreasing at the rate of 2 volts per minute, what is the rate of change of the current? (10)

$V = 10I$

$\frac{dV}{dt} = 10\frac{dI}{dt}$

$\frac{dV}{dt} = -2 \qquad \frac{dI}{dt} = \frac{-2}{10} = -.2 \text{ amps/min}$

13 all
must use units
sign on units

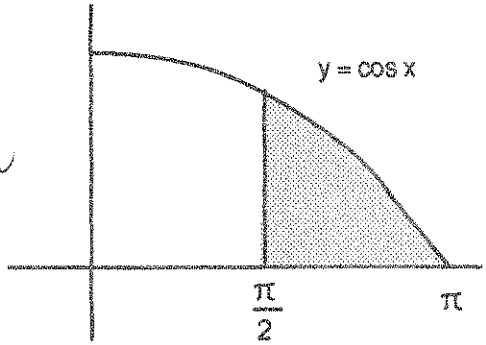
all but 3 close

10 min

38

easy page

5. Find the area of the shaded region: (8)



lousy picture

$A_{\frac{\pi}{2}}^{\pi} = \sin\pi - \sin\frac{\pi}{2}$

$= 0 - 1 = -1$

$F(x) = \sin x$

(1)

whoops!

6. Write out the following sums: (8)

a. $\sum_{k=1}^{5} \frac{k+1}{k}$ $\quad \frac{2}{1} + \frac{3}{2} + \frac{4}{3} + \frac{5}{4} + \frac{6}{5}$ $\quad 7\frac{17}{60}$ $\quad$ all but 1

b. $\sum_{k=2}^{6} (-1)^k (k^2+2)$ $= (2^2+2) - (3^2+2) + (4^2+2) - (5^2+2) + (6^2+2)$

$= 6 - 11 + 18 - 27 + 38 = 24$ $\quad$ all but 4

7. Write in sigma notation: (4)

$\frac{2}{3} + \frac{2}{4} + \frac{2}{5} + \frac{2}{6}$ $\quad \sum_{k=3}^{6} \frac{2}{k}$

8. Solve for y as a function of x: (12)

a. $\frac{dy}{dx} = 4x^2 - \frac{2}{x^2} = 4x^2 - 2x^{-2}$

12 all

5 + c

$\frac{4x^3}{3} - \frac{2x^{-1}}{-1} + C$

$\frac{4}{3}x^3 + \frac{2}{x} + C$

value points

b. $\frac{dy}{dx} = 2\cos(3x)$, $y = 3$ when $x = 0$. (~~don't write C=0~~)

16 all

$y = \frac{2}{3}\sin 3x + C$ $\quad y = \frac{2}{3}\sin 3x + 3$

many ways

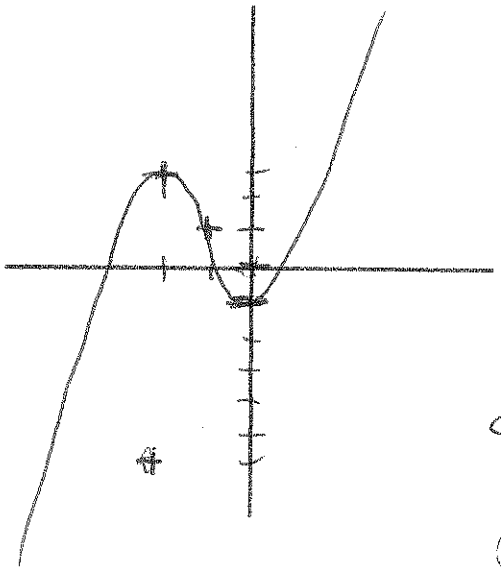
$3 = \frac{2}{3}\sin 0 + C$

$C = 3$

20 pts

32

9. Carefully sketch the graph of $f(x) = x^3 + 3x^2 - 1$. Find x-y coordinates of critical points and points of inflection (if any.) (15)



$f'(x) = 3x^2 + 6x = 0$

$3x(x+2)$

$x = 0, -2$

$f''(x) = 6x + 6 = 0$

$x = -1$

x	y
0	-1
-1	1
-2	3

C.P. $(0,-1)$ $(-2,3)$

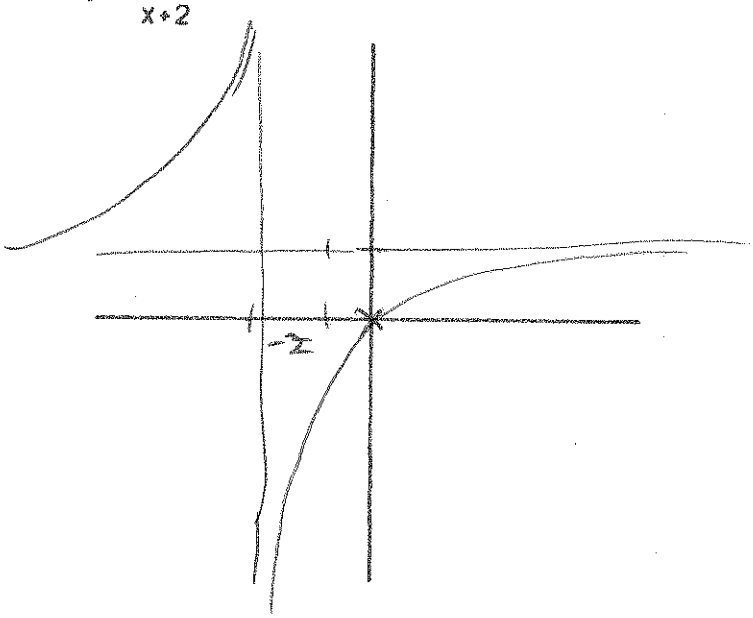
P I $(-1,1)$

-8 +12 -1

15 all must close

10. Sketch the graph of the following. Give equations of asymptotes (if any). (15)

$y = \frac{x}{x+2}$



VA $x = -2$

HA $\frac{1}{1+\frac{2}{x}} \to 1$

$y = 1$

must 15 all

$\lim_{x \to -2^+} \frac{x}{x+2} = \frac{-2}{+} = -\infty$

$\lim_{x \to -2^-} \frac{x}{x+2} = \frac{-2}{-} = +\infty$

$\frac{dy}{dx} = \frac{(x+2) - x}{(x+2)^2} = \frac{2}{(x+2)^2}$ no C.P. $dx \neq 0$

$= 2(x+2)^{-2}$

$\frac{d^2y}{dx^2} = -4(x+2)^{-3}$ no P.I