Time just right First left @ 35
$\bar{x} = 61.1$ 36
$m = 62.5$ 42
44 49

MATH 131
Test I
October 4, 1993 Name ____________ 7 left by 50
bunch @ 52 26

1. Find the derivatives of each: (do NOT simplify). (42)

a. $f(x) = 4\sqrt{x} + 4x^{12} - \sec x + \frac{4}{x^3}$

$= 4x^{1/2} + 4x^{12} - \sec x + 4x^{-3}$ $f'(x) = 2x^{-1/2} + 48x^{11} - \sec x \tan x - 12x^{-4}$

15 all

b. $y = \frac{3x^2 + 2x - 1}{\tan x}$ $\frac{dy}{dx} = \frac{\tan x\,(6x+2) - (3x^2+2x-1)\sec^2 x}{\tan^2 x}$

20

c. $y = 5\sqrt{x^2 - 7x}$

$5(x^2-7x)^{1/2}$ $\frac{dy}{dx} = \frac{5}{2}(x^2-7x)^{-1/2}(2x-7)$ 17

d. $y = \sin(\cos x)$

$\frac{dy}{dx} = \cos(\cos x)(-\sin x)$ 13

(many used product)

e. $y = (3x-5)^5$, find $\frac{d^2y}{dx^2}$ $\frac{dy}{dx} = 5(3x-5)^4(3)$

$= 15(3x-5)^4$ 15

$\frac{d^2y}{dx^2} = 60(3x-5)^3(3)$ (one forgot y'')

f. $y = 4\sec(3x^2)$

$\frac{dy}{dx} = 4\sec(3x^2)\tan(3x^2)\,6x$

$= 24x\sec(3x^2)\tan(3x^2)$ 13

g. $y = \frac{\sin 4x}{\sqrt{x^3 + \cos x^2}}$ $= \frac{\sin 4x}{(x^3+\cos x^2)^{1/2}}$

$\frac{dy}{dx} = \frac{(x^3+\cos x^2)^{1/2}(\cos 4x)4 - \sin 4x\left(\frac{1}{2}(x^3+\cos x^2)^{-1/2}(3x^2 - \sin x^2\, 2x)\right)}{x^3 + \cos x^2}$

3 all
many not for chain

42

2. Find the following limits exactly, if they exist (± ∞ allowed). If not, say so. (12)

good prob

a. $\lim_{x \to \infty} \dfrac{3x^4 + x^3 - 7}{4 - 2x^2} = \lim_{x\to\infty} \dfrac{3x^2 + x - 7/x^2}{\cancel{x}\cancel{4}\, 4/x^2 - 2} \rightarrow \dfrac{\infty}{-2} = -\infty$

7

6 sign

b. $\lim_{x \to 5^-} \dfrac{x - 8}{x - 5} = +\infty$

$\dfrac{5-8}{4.99-5} = \dfrac{-3}{-.01} = \infty$

14

4 sign

c. $\lim_{x \to 9} \dfrac{\sqrt{x} - 3}{x - 9}$ good

$\dfrac{\sqrt{x}-3}{x-9} \cdot \dfrac{\sqrt{x}+3}{\sqrt{x}+3} = \dfrac{\cancel{x-9}}{(\cancel{x-9})(\sqrt{x}+3)} = \dfrac{1}{\sqrt{x}+3} \rightarrow \dfrac{1}{3+3} = \dfrac{1}{6}$

1 got

good

3. For the function (10)

ans calc guess 0

$f(x) = \begin{cases} K & x \le 0 \\ x + 2, & 0 < x \le 2 \\ x^2, & x > 2 \end{cases}$

Use K

a. Is f continuous at x = 2? Explain. $f(2) = 4$, $\lim f(x) = 4$ many missed

3

b. What is f(g(4)) when g(x) = x - 3 ? $f(1) = 1+2 = \boxed{3}$ ← many missed

c. What is $\lim_{x \to 2} f(x)$? 4

4. Using only the definition, find $f'(x)$ for (10)

$f(x) = \dfrac{1}{2x + 1}$

many missed

good choice

7

$\lim_{h\to 0} \dfrac{1}{h}\left(\dfrac{1}{2(x+h)+1} - \dfrac{1}{2x+1}\right)$

$= \lim_{h\to 0} \dfrac{1}{h} \dfrac{2x+1 - (2(x+h)+1)}{(2(x+h)+1)(2x+1)}$ $\quad -2x-2h-1$

$= \lim_{h\to 0} \dfrac{1}{\cancel{h}} \dfrac{-2\cancel{h}}{(2(x+h)+1)(2x+1)} = \dfrac{-2}{(2x+1)(2x+1)}$

$= \dfrac{-2}{(2x+1)^2}$

32

5. The height (ft.) of an object above the ground after t seconds is given by $s = 320 + 64t - 16t^2$, $t \geq 0$. (Give units in answers.) (11)

3 all

2 a. How high is it initially? (at ~~the beginning~~.)

$t = 0 \quad s = 320$ ft

2 b. What is the initial velocity? Up or down?

$\frac{ds}{dt} = 64 - 32t \quad t = 0 \quad \frac{ds}{dt} = 64$ ft/sec UP

2 c. What is the acceleration at t = 1?

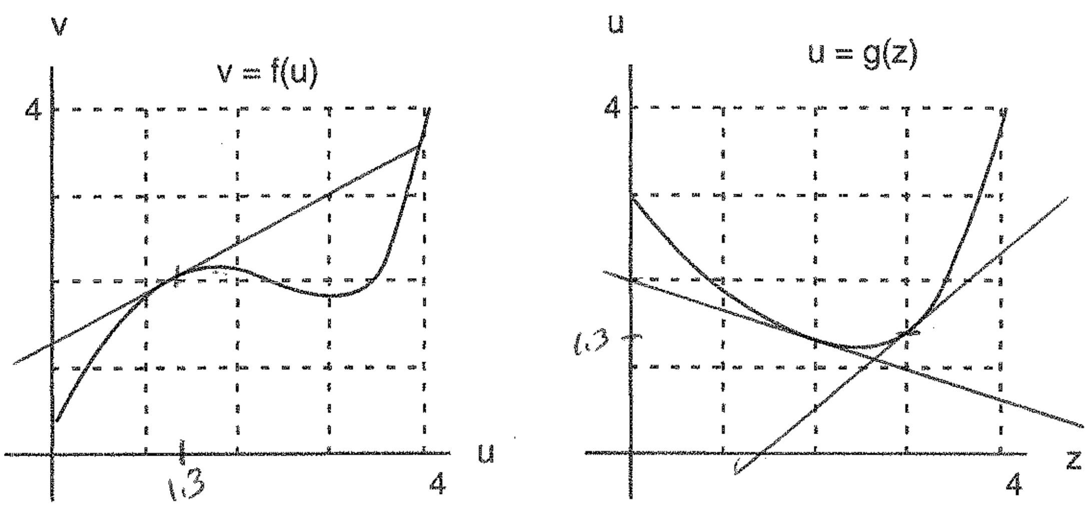
$\frac{ds}{dt} = -32$ ft/sec/sec.

5 d. How high does it go?

$64 - 32t = 0 \quad t = 2 \quad S = 320 + 128 - 64$

$t = 2 \quad = 384$ ft

6. (15)



2 a. What is g(0)? $\boxed{3}$

4 b. Carefully estimate g'(2). $(0, 2)\ (4, .6)$ $\frac{2 - .6}{0 - 4} = \frac{1.4}{-4} = \boxed{~~.56~~ \; -.35}$

2 c. What is f(g(1)) ? $f(1.8) = \boxed{2.2}$

6 d. Carefully estimate dv/dz at z = 3.

$$\frac{dv}{dz} = \frac{dv}{du} \cdot \frac{du}{dz}$$

$$= \boxed{.5175}$$

$\frac{du}{dz} \quad (2, .5)\ (4, 2.3)$

$\frac{2.3 - .5}{4 - 2} = \frac{1.8}{2} = .9$

$\frac{dv}{du} \quad u = 1.3 \quad (0, 1.3)\ (4, 3.6)$

$\frac{3.6 - 1.3}{4} = \frac{2.3}{4}$

$= .575$

1 all

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