Math 16A (Summer 2010)
Kouba
Quiz 4

PRINT Name : KEY

Exam ID # : _____

1.) (5 pts. each) Use shortcut rules to find the derivatives of each function. Do not simplify answers.

a.) $y = x \tan x$

$\xrightarrow{D}\ y' = x \cdot \sec^2 x + (1) \cdot \tan x$

b.) $f(x) = (7x - 4)^{3/2}$

$\xrightarrow{D}\ f'(x) = \frac{3}{2}(7x-4)^{1/2} \cdot 7$

c.) $y = \dfrac{2 + \cos x}{3 - \sin x}$

$\xrightarrow{D}\ y' = \dfrac{(3-\sin x)(-\sin x) - (2+\cos x)(-\cos x)}{(3-\sin x)^2}$

d.) $y = \left(\dfrac{x-4}{5-2x}\right)^{20}$

$\xrightarrow{D}\ y' = 20\left(\dfrac{x-4}{5-2x}\right)^{19} \cdot \dfrac{(5-2x)(1) - (x-4)(-2)}{(5-2x)^2}$

e.) $g(x) = 5 + 4\cos(x^2)$

$\xrightarrow{D}\ g'(x) = 4 \cdot -\sin(x^2) \cdot 2x$

f.) $g(x) = \tan^3(\sec(x^3))$ (layers: $(\,)^3$, tan, sec, x^3)

$\xrightarrow{D}\ g'(x) = 3\tan^2(\sec(x^3)) \cdot \sec^2(\sec(x^3)) \cdot$

$\hookrightarrow \sec(x^3)\tan(x^3) \cdot 3x^2$

3.) (5 pts. each) a.) Assume that $f(x) = x^3(x-5)^2$. Solve $f'(x) = 0$ for x.

$\xrightarrow{D}$ $f'(x) = x^3 \cdot 2(x-5) + 3x^2(x-5)^2$

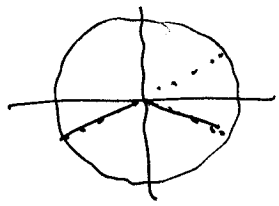
$= x^2(x-5)\cdot[2x + 3(x-5)] = x^2(x-5)[5x-15] = 0$

$\longrightarrow \quad x=0,\ x=5,\ x=3$

b.) Assume that $f(x) = 4\sin x - x^2$. Solve $f''(x) = 0$ for x, $0 \le x \le 2\pi$.

$\xrightarrow{D}$ $f'(x) = 4\cos x - 2x \xrightarrow{D} f''(x) = -4\sin x - 2 = 0$

$\longrightarrow \sin x = \frac{-1}{2}$



$x = 210°,\ 330°$

OR

$x = \frac{7\pi}{6},\ \frac{11\pi}{6}$

4.) Assume that a calculus textbook is projected straight up at 96 feet per second from the top of a building 128 feet high.

a.) (3 pts.) Write an equation for the height $s(t)$ (feet) of the textbook above the ground at time t seconds.

$$s(t) = -16t^2 + 96t + 128$$

b.) (2 pts.) What is the height of the textbook when $t = 2$ seconds ? $t = 6$ seconds ?

$s(2) = -16(4) + 96(2) + 128 = 256$ ft.

$s(6) = -16(36) + 96(6) + 128 = 128$ ft.

c.) (5 pts.) When does the textbook reach its highest point and how high is it ?

$\leftarrow s'(t) = 0 \quad \xrightarrow{D} s'(t) = -32t + 96 = 0 \longrightarrow$

$t = 3$ sec. and

$s(3) = -16(9) + 96(3) + 128 = 272$ ft.