Math 21A
Kouba
Discussion Sheet 8

1.) Use a differential to estimate the value of each number.

a.) $\sqrt{83}$ b.) $(31)^{1/5}$ c.) $\tan(0.1+\pi/4)$ d.) $\log_{10} 96$

2.) Use a differential to show that $\sqrt{16+8h^4} \approx 4+h^4$ for "small" h.

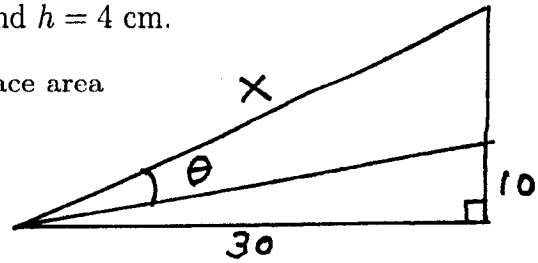
3.) The edge x of an equilateral triangle is measured with absolute percentage error of at most 3%. Use a differential to estimate the maximum absolute percentage error in computing the triangle's

a.) perimeter. b.) area

4.) Consider a closed right circular cylinder of height h and radius r. If the radius increases at the rate of 3 cm./sec. and the height decreases at the rate of 5 cm./sec., find the rate of change of each of the following when $r = 6$ cm. and $h = 4$ cm.

a.) cylinder's volume b.) cylinder's surface area

5.) Consider the given figure. If x is increasing at the rate of 5 in./min., at what rate is angle θ changing when $x = 50$ in. ?



6.) *Car* 1 starts on the graph of $y = e^x$ at the point $(0, 1)$ and *Car* 2 starts on the graph of $y = 3x - 2$ at the point $(0, -2)$. If both cars start moving to the right at the same time in such a way that $\frac{dx}{dt} = 1$ mile per minute, at what rate is the distance between the cars changing when

a.) $t = 1$ minute ? b.) $t = 5$ minutes ?

7.) Use the instructions for detailed graphing from class to sketch the graph of each function.

a.) $y = 2x^2 - 8x$ b.) $f(x) = x^3 + 3x^2$

c.) $g(x) = x^4 - 3x^2$ d.) $y = x^2(x-2)$ on interval $[-2, 4]$

e.) $g(x) = \sin x + \cos x$ on interval $[0, 2\pi]$ f.) $y = x - 12x^{1/3}$ on interval $[-1, 27]$

g.) $y = x(x-8)^3$ h.) $f(x) = (x-1)^2(x+4)^3$

i.) $g(x) = \sin x - \sqrt{3}\cos x$ on interval $[0, 2\pi]$

j.) $y = \sec^2 x \tan x$ on interval $[-\pi/3, \pi/3]$

k.) $y = x - 4\sqrt{x}$ l.) $f(x) = 2x - 6x^{2/3}$

m.) $y = x^2 e^{-x}$ n.) $f(x) = x^2 \ln x$

o.) $y = e^{-x^2}$ p.) $y = xe^{-x^2}$

q.) $y = \dfrac{x^2}{2} + \dfrac{1}{x}$ r.) $y = \dfrac{x^2+3}{x+1}$ (tilted asymptote !)

s.) $y = \dfrac{8x}{x^2+1}$ t.) $y = \dfrac{8}{x^2+2}$

u.) $y = \dfrac{x-2}{x^2-1}$ v.) $y = \dfrac{x^2-4}{x^2-9}$

w.) $y = \dfrac{6e^x}{e^x+1}$ x.) $y = \dfrac{\ln x}{1+\ln x}$

8.) The first derivative f' is given. Determine x-values for all relative maximums and minimums for f.

a.) $f'(x) = x^4(x-1)^2(x+3)^3$ b.) $f'(x) = \dfrac{x^2-3x-10}{x^2-1}$

9.) The second derivative f'' is given. Determine x-values for all inflection points for f.

a.) $f''(x) = x(x-2)^2(x+4)^3$ b.) $f''(x) = \dfrac{e^{2x}-4e^x+3}{e^{2x}+3e^x+2}$

10.) The first derivative f' is given. Determine x-values for all inflection points for f.

a.) $f'(x) = x(x-3)(x+1)$ b.) $f'(x) = x^4(2x-1)^2$

++++++++++++++++++++++++++++++++++

The following problem is for recreational purposes only.

11.) How many distinct orderings are there of the letters in the following words ?

a.) MILE b.) BALL c.) CLIMATE d.) MISSISSIPPI

"You never regret being kind." –Nicole Shepherd