Math 131, Spring 2004
Quiz #5, Discussion Section A (Thursday, 11:00-12:00)

Quiz problems should be solved using the methods discussed in this course. A calculator is not permitted. To receive full credit, show enough work to make it clear how you got your answer.

Name: Answer Key ID# _____

1. Differentiate $f(x) = \dfrac{1+\sin x}{x+\cos x}$. Please simplify your work.

$$f'(x) = \frac{(x+\cos x)\cos x - (1+\sin x)(1-\sin x)}{(x+\cos x)^2}$$

$$= \frac{x\cos x + \cos^2 x - (1-\sin^2 x)}{(x+\cos x)^2}$$

$$= \frac{x\cos x}{(x+\cos x)^2}$$

2. The volume of a circular cone is $V = \frac{1}{3}\pi r^2 h$, where r is the radius and h is the height. Find the rate of change of **height with respect to volume** if the radius r is constant. Be sure to include the units.

$$V = \frac{1}{3}\pi r^2 h$$

$$\Rightarrow h = \frac{3V}{\pi r^2}$$

$$\Rightarrow \frac{dh}{dV} = \frac{3}{\pi r^2}$$

Math 131, Spring 2004
Quiz #5, Discussion Section B (Tuesday, 12:00-1:00)

Quiz problems should be solved using the methods discussed in this course. A calculator is not permitted. To receive full credit, show enough work to make it clear how you got your answer.

Name: Answer Key ID# _____

1. The volume of a circular cone is $V = \frac{1}{3}\pi r^2 h$, where r is the radius and h is the height. Find the rate of change of **height with respect to radius** if the volume V is constant. Be sure to include the units.

$$V = \frac{1}{3}\pi r^2 h$$

$$\Rightarrow h = \frac{3V}{\pi r^2} = \frac{3}{\pi} V r^{-2}$$

$$\Rightarrow \frac{dh}{dr} = -\frac{6}{\pi} V r^{-3} = \frac{-6V}{\pi r^3}$$

2. Find the derivatives of the following functions:

a) (1 point) $f(t) = (t-1)e^t$

$$f'(t) = (t-1)e^t + e^t$$
$$= e^t(t-1+1)$$
$$= te^t$$

b) (2 points) $y = \dfrac{x}{x^4 + 2e^x + 1}$

$$y' = \frac{1\cdot(x^4+2e^x+1) - x(4x^3+2e^x)}{(x^4+2e^x+1)^2}$$
$$= \frac{x^4+2e^x+1-4x^4-2xe^x}{(x^4+2e^x+1)^2}$$
$$= \frac{-3x^4+1+2e^x-2xe^x}{(x^4+2e^x+1)^2}$$

Math 131, Spring 2004
Quiz #5, Discussion Section C (Thursday, 12:00-1:00)

Quiz problems should be solved using the methods discussed in this course. A calculator is not permitted. To receive full credit, show enough work to make it clear how you got your answer.

Name: Answer Key ID# _____

Differentiate the following functions, and please simplify your work as much as possible. (2 points each)

1. $f(x) = \dfrac{ax+b}{cx+d}$, where a, b, c, and d are constants.

$$f'(x) = \frac{(cx+d)a - c(ax+b)}{(cx+d)^2}$$
$$= \frac{acx + ad - acx - bc}{(cx+d)^2}$$
$$= \frac{ad-bc}{(cx+d)^2}$$

2. $y = x^e e^x$

$$y' = ex^{e-1}e^x + x^e e^x$$
$$= e^x(ex^{e-1} + x^e)$$

3. $g(w) = 2\csc w + \tan w + \sin w$

$$g'(w) = -2(\csc w \cot w) + \sec^2 w + \cos w$$