Formula Sheet Math 152, Final Exam 2001-01

$\sin(-x) = -\sin x$	$\cos(-x) = \cos x$	$\tan(-x) = -\tan x$
$\sin^2 x + \cos^2 x = 1$	$\tan^2 x + 1 = \sec^2 x$	$\cos^2 x = \frac{1}{2}(1 + \cos(2x))$
$\cos(2x) = \cos^2 x - \sin^2 x$	$\sin(2x) = 2\sin x \cos x$	$\sin^2 x = \frac{1}{2}(1 - \cos(2x))$
$\cos(2x) = 2\cos^2 x - 1$	$\cos(x) = 2\cos^2 \frac{x}{2} - 1$	$\cos(x) = 1 - 2\sin^2 \frac{x}{2}$
$\frac{d}{dx} \sin x = \cos x$	$\frac{d}{dx} \cos x = -\sin x$	$\frac{d}{dx} \tan x = \sec^2 x = \frac{1}{\cos^2 x}$
$\frac{d}{dx} \sin^{-1} x = \frac{1}{\sqrt{1-x^2}}$	$\frac{d}{dx} \tan^{-1} x = \frac{1}{1+x^2}$	$\frac{d}{dx} \sec x = \tan x \sec x$
$\frac{d}{dx} e^{\alpha x} = \alpha e^{\alpha x}$	$\frac{d}{dx} x^{\alpha} = \alpha x^{\alpha - 1}$	$\frac{d}{dx} \ln\lvert x\rvert = \frac{1}{x}$

Values of trigonometric functions			
x	$\cos x$	$\sin x$	$\tan x$
0	1	0	0
$\frac{\pi}{6}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\frac{1}{\sqrt{3}}$
$\frac{\pi}{4}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	1
$\frac{\pi}{3}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\sqrt{3}$
$\frac{\pi}{2}$	0	1	not defined

$$\int \sec(t)\,dt = \ln(\sec(t) + \tan(t)) + C$$

$$\int \sec^3(t)\,dt = \frac{1}{2}\tan(t)\sec(t) + \frac{1}{2}\ln(\sec(t) + \tan(t)) + C$$

$$e = \lim_{n\to\infty}\left(1 + \frac{1}{n}\right)^n = \lim_{n\to\infty}\left(\frac{n+1}{n}\right)^n$$

$$e = \sum_{n=0}^{\infty} \frac{1}{n!}$$

$$\ln(n+1) - \ln(n) = \frac{1}{n} + O(\frac{1}{n^2})$$

$$\frac{1}{\ln(n)} - \frac{1}{\ln(n+1)} = \frac{\ln(n+1) - \ln(n)}{\ln(n+1)\ln(n)} < \frac{1}{n}, \qquad \text{for large } n.$$

The last equation actually holds for all but the first few integers; it tells us that $\frac{1}{\ln(n)}$ and $\frac{1}{\ln(n+1)}$ are almost the same numbers for large n.