Formula Sheet for Math 151, Final Exam

EXPONENTIAL AND LOGARITHMIC FUNCTIONS

$$e^{x+y} = e^x e^y\,, \quad e^{x-y} = \frac{e^x}{e^y}\,, \quad (e^x)^y = e^{xy}$$

$$\ln(xy) = \ln x + \ln y\,, \quad \ln\left(\frac{x}{y}\right) = \ln x - \ln y\,, \quad \ln(x^y) = y\ln(x)$$

$$\ln(e^x) = x\,, \quad e^{\ln x} = x\,, \quad a^x = e^{(\ln a)x}\,, \quad \log_a x = \frac{\ln x}{\ln a}$$

TRIGONOMETRY

$$\begin{array}{llllll} \sin(0) = 0\,, & \sin(\pi/6) = 1/2\,, & \sin(\pi/4) = \sqrt{2}/2\,, & \sin(\pi/3) = \sqrt{3}/2\,, & \sin(\pi/2) = 1 \\ \cos(0) = 1\,, & \cos(\pi/6) = \sqrt{3}/2\,, & \cos(\pi/4) = \sqrt{2}/2\,, & \cos(\pi/3) = 1/2\,, & \cos(\pi/2) = 0 \end{array}$$

$$\tan x = \frac{\sin x}{\cos x}\,, \quad \cot x = \frac{\cos x}{\sin x}\,, \quad \sec x = \frac{1}{\cos x}\,, \quad \csc x = \frac{1}{\sin x}$$

$$\sin^2 x + \cos^2 x = 1\,, \quad \sin(2x) = 2\sin x\cos x\,, \quad \cos(2x) = \cos^2 x - \sin^2 x$$

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

GEOMETRY

Volume of a cone/pyramid: $\frac{1}{3}$(area of base)(height).

Volume of a sphere: $\frac{4}{3}\pi r^3$.

DERIVATIVES

$$\frac{d}{dx}\tan x = \sec^2 x\,, \ \frac{d}{dx}\sec x = \sec x\tan x\,, \ \frac{d}{dx}\cot x = -\csc^2 x\,, \ \frac{d}{dx}\csc x = -\csc x\cot x$$

$$\frac{d}{dx}\sin^{-1} x = \frac{1}{\sqrt{1-x^2}}\,, \quad \frac{d}{dx}\tan^{-1} x = \frac{1}{1+x^2}\,, \quad \frac{d}{dx}\sec^{-1} x = \frac{1}{|x|\sqrt{x^2-1}}$$

NEWTON'S METHOD

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$
