

## Formula Sheet for Math 151, Exam 2

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### EXPONENTIAL AND LOGARITHMIC FUNCTIONS

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

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

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

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### TRIGONOMETRY

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

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

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

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

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### GEOMETRY

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

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

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### DERIVATIVES

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

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

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### NEWTON'S METHOD

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

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