

Formula Sheet for Math 151, Exam 1

EXPONENTIAL AND LOGARITHMIC FUNCTION

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

TRIGONOMETRY

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

x	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$
$\sin(x)$	0	1/2	$\sqrt{2}/2$	$\sqrt{3}/2$	1
$\cos(x)$	1	$\sqrt{3}/2$	$\sqrt{2}/2$	1/2	0
$\tan(x)$	0	$\sqrt{3}/3$	1	$\sqrt{3}$	$\pm\infty$

GEOMETRY

Distance: $d = \sqrt{(x_1 - x_0)^2 + (y_1 - y_0)^2}$

Volume: Cone/Pyramid: $\frac{1}{3}$ base area \times height, Sphere: $\frac{4}{3}\pi r^3$

Lines: Point-point: $\frac{y - y_0}{x - x_0} = \frac{y_1 - y_0}{x_1 - x_0}$, Point-slope: $y - y_0 = m(x - x_0)$

DERIVATIVES

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