

Formula Sheet for Math 135, Final Exam, Fall 2005

The Quadratic Formula

If $a \neq 0$, then the solutions to the equation $ax^2 + bx + c = 0$ are given by the formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Exact Trigonometric Values

Function \ θ	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$
$\sin \theta$	0	1/2	$\sqrt{2}/2$	$\sqrt{3}/2$	1
$\cos \theta$	1	$\sqrt{3}/2$	$\sqrt{2}/2$	1/2	0
$\tan \theta$	0	$\sqrt{3}/3$	1	$\sqrt{3}$	undefined

Sum and Difference Formulas

$$\sin(\alpha + \beta) = \sin(\alpha)\cos(\beta) + \cos(\alpha)\sin(\beta), \quad \sin(\alpha - \beta) = \sin(\alpha)\cos(\beta) - \cos(\alpha)\sin(\beta).$$

$$\cos(\alpha + \beta) = \cos(\alpha)\cos(\beta) - \sin(\alpha)\sin(\beta), \quad \cos(\alpha - \beta) = \cos(\alpha)\cos(\beta) + \sin(\alpha)\sin(\beta)$$

Obscure Trigonometric Functions

$$\cot \theta = \cos \theta / \sin \theta, \quad (\cot x)' = -\csc^2 x.$$

$$\csc \theta = 1 / \sin \theta, \quad (\csc x)' = -\csc x \cot x.$$

Exponential Growth and Compounding

A quantity is said to undergo exponential growth if the amount $P(t)$ at time t is given by a function of the form $P_0 e^{kt}$ for some constants P_0 and k . (If $k < 0$, the term exponential decay is used.)

An amount of money P_0 invested at an annual interest rate of r compounded n times a year will have grown to

$$P_0 \left(1 + \frac{r}{n}\right)^{nt}$$

after t years. If the compounding is continuous, the amount is $P_0 e^{rt}$.

Areas, Volumes, Etc

Circumference of a circle, $2\pi r$.

Area of a rectangle, lw .

Area of a circle, πr^2 .

Area of a triangle, $bh/2$.

Area of a sphere, $4\pi r^2$.

Volume of rectangular box, lwh .

Volume of a sphere, $4\pi r^3/3$.

Volume of a cylinder with circular base, $\pi r^2 h$.

Volume of a cone with circular base, $\pi r^2 h/3$.

Summation Formulas

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}, \quad \sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}, \quad \sum_{i=1}^n i^3 = \frac{n^2(n+1)^2}{4}.$$