MATH 112 FORMULA SHEET

Logarithms and Exponentials

The value A after t years of an investment of principal P paying interest at an annual rate r:

with interest compounded n times a year: $A = P(1 + r/n)^{nt}$

with interest compounded continuously: $A = Pe^{rt}$

The population P after time t, with initial population P_0 and relative growth rate k:

$$P = P_0 e^{kt}$$

The mass M of a radioactive element after time t, with initial amount M_0, and relative decay rate k:

$$M = M_0 e^{-kt}$$

Change of base formula:

$$\log_a x = \frac{\log_b x}{\log_b a}$$

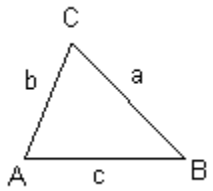
Trigonometry:

Notation: $\sin^2(\theta) = (\sin\theta)^2$

Arc Length: (θ in radians): $S = r\theta$ Area of a sector (θ in radians): $A_s = \frac{1}{2}r^2\theta$

Area of a triangle: $A_\Delta = \frac{1}{2}ab\sin C$

Law of Cosines: $a^2 = b^2 + c^2 - 2bc\ \cos A$



Addition and Subtraction Formulas:

$$\sin(a+b) = \sin a\cos b + \cos a\sin b$$
$$\sin(a-b) = \sin a\cos b - \cos a\sin b$$
$$\cos(a+b) = \cos a\cos b - \sin a\sin b$$
$$\cos(a-b) = \cos a\cos b + \sin a\sin b$$

Double Angle Formulas:

$$\sin(2a) = 2\sin a\cos a$$
$$\cos(2a) = \cos^2 a - \sin^2 a$$

Half Angle Formulas:

$$\sin\left(\frac{a}{2}\right) = \pm\sqrt{\frac{1-\cos a}{2}}$$
$$\cos\left(\frac{a}{2}\right) = \pm\sqrt{\frac{1+\cos a}{2}}$$