MATH 115 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: $A = P \left(1 + \frac{r}{n}\right)^{nt}$

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:

Arc Length: $(\theta$ in radians): $S = r\theta$

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

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

Addition and Subtraction Formulas: Double Angle Formulas: Half-angle Formulas:

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

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

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

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

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

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

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

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