**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: (\( \theta \) in radians): \( S = r\theta \)

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

Area of a triangle: \( A = \frac{1}{2} ab \sin C \)

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

Law of Sines: \( \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \)

Addition and Subtraction Formulas:     Double Angle Formulas:     Half Angle Formulas:
\[
\sin(a + b) = \sin a \cos b + \cos a \sin b \\
\sin(a - b) = \sin a \cos b - \cos a \sin b \\
\cos(a + b) = \cos a \cos b - \sin a \sin b \\
\cos(a - b) = \cos a \cos b + \sin a \sin b
\]
\[
\sin(2a) = 2\sin a \cos a \\
\cos(2a) = \cos^2 a - \sin^2 a
\]
\[
\sin\left(\frac{a}{2}\right) = \pm \sqrt{\frac{1 - \cos a}{2}} \\
\cos\left(\frac{a}{2}\right) = \pm \sqrt{\frac{1 + \cos a}{2}}
\]