**Selected Formulas for Calculus Tests**

[Note: This is the formula sheet that I provided with the Final Exam. For Test #1, I provided just the derivatives of the inverse trigonometric functions; for Test #2, I added the double-angle formulas; for Test #3, I added Simpson's Rule. For the Final Exam, I added the various tests for convergence of a series.]

**Inverse Trigonometric Functions**

$$\frac{d}{dt}\arcsin(t) = \frac{1}{\sqrt{1-t^2}}$$

$$\frac{d}{dt}\arccos(t) = -\frac{1}{\sqrt{1-t^2}}$$

$$\frac{d}{dt}\arctan(t) = \frac{1}{1+t^2}$$

$$\frac{d}{dt}\text{arcsec}(t) = \frac{1}{t\sqrt{t^2-1}}$$

$$\frac{d}{dt}\text{arccsc}(t) = -\frac{1}{t\sqrt{t^2-1}}$$

$$\frac{d}{dt}\text{arccot}(t) = -\frac{1}{1+t^2}$$

**Double-Angle Formulas**

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

$$\cos(2\theta) = cos^2(\theta) - sin^2(\theta) = 1 - 2\sin^2(\theta) = 2\,cos^2(\theta) - 1$$

$$\tan(2\theta) = \frac{2\tan(\theta)}{1 - tan^2(\theta)}$$

**Simpson's Rule:** $\frac{2}{3}\,MR + \frac{1}{3}TR$, where *MR* is the Midpoint Rule, and *TR* is the Trapezoidal Rule.

**Divergence Test**

If the sequence $b_0, b_1, b_2, \ldots$ does not converge to 0, then the series $\sum_{k=0}^{\infty} b_k$ diverges.

**Alternating Series Test**

Suppose that a series has the form $a_1 - a_2 + a_3 - \cdots + (-1)^{k+1}a_k + \ldots$, where

- each $a_k$ is positive,
- each $a_k$ is larger than $a_{k+1}$, and
- $\lim_{k\to\infty} a_k = 0$.

Then

i. the series converges to some number $S$, and

ii. the error $|S - s_n|$ after summing $n$ terms is less than $a_{n+1}$.

**Ratio Test**

Let $L = \lim_{k\to\infty}\left|\frac{b_{k+1}}{b_k}\right|$.

- If $L < 1$, then the series converges.
- If $L > 1$, then the series diverges.
- If $L = 1$, then this test gives no information about convergence or divergence.