Calculus with Analytic Geometry II

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1 Derivative/Integration Worksheet

- I. Use the limit definition of the derivative to find $\frac{d}{dx}\frac{1}{x}$.
- II. Use the figure below and the squeeze theorem to show that $\lim_{x\to 0} \frac{\sin(x)}{x} = 1$.



- III. Use implicit differentiation to determine the derivative of $\arcsin(x)$.
- IV. Use the limit definition of the definite integral to find $\int_0^1 x^3 dx$. Hint: consider the following summation

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

- V. Verify your answer to part IV using the fundamental theorem of calculus.
- VI. Use u-substitution to evalute the integral $\int_0^{\pi/2} \sin^3(x) \cos(x) dx$.