Quiz:

1.) Compute the antiderivatives of the following.

(2) a.) $f(x) = \sin x$

$F(x) = -\cos(x)$

(2) b.) $g(x) = x^2 + 3x + \sec^2(x)$

$G(x) = \frac{1}{3}x^3 + \frac{3}{2}x^2 + \tan(x)$

(2) c.) $h(x) = 1 + x - 3x^2$

$H(x) = x + \frac{1}{2}x^2 - x^3$

(4) 2.) Compute the area under $y = x^2 + 1$ from $x = 0$ to $x = 1$.

$$A = \lim_{n\to\infty} \sum_{i=1}^{n} f(x_i)\,\Delta x \qquad \Delta x = \frac{1-0}{n} = \frac{1}{n}$$

$$x_i = 0 + \Delta x\, i = \frac{i}{n}$$

$$= \lim_{n\to\infty} \sum_{i=1}^{n} \left(\frac{i^2}{n^2} + 1\right)\frac{1}{n} = \lim_{n\to\infty}\left[\frac{1}{n^3}\sum_{i=1}^{n} i^2 + \frac{1}{n}\sum_{i=1}^{n} 1\right]$$

$$= \lim_{n\to\infty}\left[\frac{n(n+1)(2n+1)}{6n^3} + \frac{1}{n}(n)\right]$$

$$= \lim_{n\to\infty}\left[\frac{2n^3+3n^2+n}{6n^3} + 1\right] = \lim_{n\to\infty}\left[\frac{2 + \frac{3}{n} + \frac{1}{n^2}}{6} + 1\right]$$

$$= \frac{1}{3} + 1 = \frac{4}{3}$$