Precalc15.3

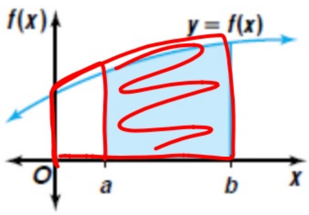
Find values of integrals
Find the area under the curve of polynomial graphs

antiderivative

integral

definite integral

integration



p. 962

$$1 + 2 + 3 + \cdots + n = \frac{n(n+1)}{2}$$

$$1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

$$1^3 + 2^3 + 3^3 + \cdots + n^3 = \frac{n^2(n+1)^2}{4}$$

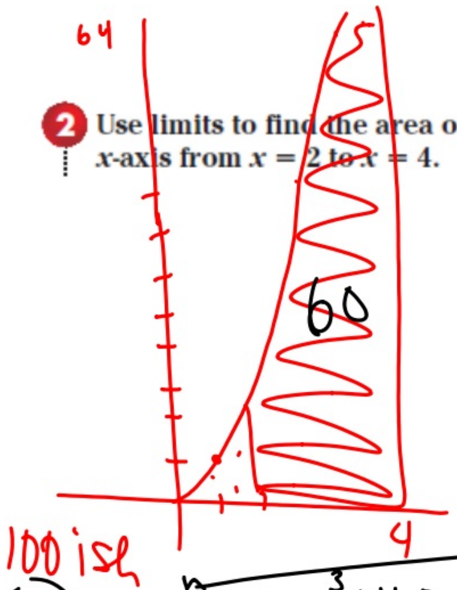
$$1^4 + 2^4 + 3^4 + \cdots + n^4 = \frac{6n^5 + 15n^4 + 10n^3 - n}{30}$$

$$1^5 + 2^5 + 3^5 + \cdots + n^5 = \frac{2n^6 + 6n^5 + 5n^4 - n^2}{12}$$

y * width

Definite Integral	$\int_a^b f(x)\,dx = \lim_{n\to\infty} \sum_{i=1}^{n} f(x_i)\Delta x$ where $\Delta x = \dfrac{b-a}{n}$.

2 Use limits to find the area of the region between the graph of $y = x^3$ and the x-axis from $x = 2$ to $x = 4$.



Strategy?

$$\int_0^4 - \int_0^2$$

$\frac{4}{n}$ $\quad 0+\frac{4}{n}i$ $\qquad \frac{2}{n}$ $\quad 0+\frac{2i}{n}$

0-4

$$\lim_{n\to\infty}\sum_{i=1}^{n}\left(\frac{4i}{n}\right)^3\left(\frac{4}{n}\right)$$

$$\lim_{n\to\infty}\sum_{i=1}^{n}\frac{256 i^3}{n^4}$$

$$\lim_{n\to\infty}\frac{256}{n^4}\left(1^3+2^3+3^3\ldots\right)$$

$$\lim_{n\to\infty}\frac{256}{\cancel{n^4}}\left(\frac{\cancel{n^2}(n+1)^2}{4}\right)$$

$$\lim_{n\to\infty}\frac{64(n^2+2n+1)}{n^2}$$

64

0-2

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

$$\lim_{n\to\infty}\sum_{i=1}^{n}\frac{16 i^3}{n^4}$$

$$\lim_{n\to 0}\frac{16}{n^4}\left(1^3+2^3+3^3\ldots\right)$$

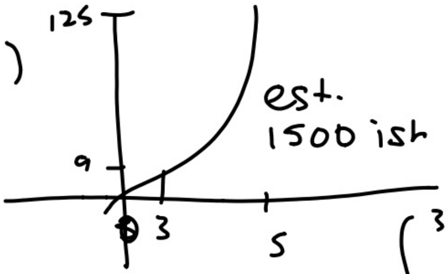
$$\frac{16}{\cancel{n^4}}\left(\cancel{n^2}(n+1)^2\right)$$

$\frac{4}{n^2}$ $\quad n^2+2n+1$

4

23. $\int_3^5 8x^3\,dx$

$8(\ )$



est.
1500 ish

$$8\int_3^5 x^3\,dx$$

$$8\int_0^5 \left(\frac{5i}{n}\right)^3\left(\frac{5}{n}\right)$$

$$\lim_{n\to\infty}\sum_{i=1}^{n} \frac{625 i^3}{n^4}$$

$$\lim_{n\to 0} \frac{625}{n^4}(1^3+2^3 \ldots) \quad \left(\frac{625}{n^4}\left(\frac{n^2(n+1)^2}{4}\right)\right)$$

$$\lim_{n\to\infty} 156.25\,(n^2+2n+1)$$

$$(1250)$$

$$\int_0^3 \left(\frac{3i}{n}\right)^3\left(\frac{3}{n}\right)$$

$$\lim_{n\to\infty}\sum_{i=1}^{n} \frac{81 i^3}{n^4}$$

$$\frac{81}{n^4}\left(\frac{n^2(n+1)^2}{4}\right)$$

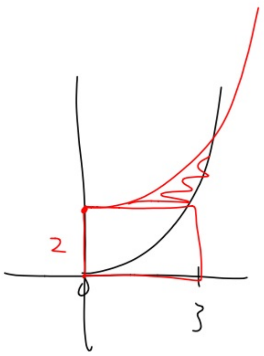
$$\frac{81}{4} = 20.25$$

$$- \; 8(20.25)$$

$$1250 - 162$$

$$1088$$

WB 15.3



$y = x^2 + 2$

$y = x^2 + 6$