4.4

15. $\int_1^4 \frac{u-2}{\sqrt{u}}\,du = \int_1^4 \left(u^{1/2} - 2u^{-1/2}\right) du$

$= \int_1^4 \left(\frac{u^1}{u^{1/2}} - \frac{2}{u^{1/2}}\right) du$

$$\frac{2}{3}u^{3/2} - 4u^{1/2} \Big|_1^4$$

$$\left[\frac{2}{3}(\sqrt{4})^3 - 4\sqrt{4}\right] - \left[\frac{2}{3}(\sqrt{1})^3 - 4\sqrt{1}\right]$$

$$\frac{16}{3} - 8 - \frac{2}{3} + 4 = \frac{14}{3} - \frac{12}{3} = \boxed{\frac{2}{3}}$$

$$\int_1^4 \frac{u-2}{\sqrt{u}}\,du$$

∫((x−2)/x^(1/2),x,1,4)

23. $\int_0^3 |2x-3|\,dx$

$|2x-3| = \begin{cases} 2x-3, & x \geq \frac{3}{2} \\ & 2x-3>0 \\ & 2x>3 \\ 3-2x, & x < \frac{3}{2} \end{cases}$

$= \int_{3/2}^{3} (2x-3)\,dx + \int_0^{3/2} (3-2x)\,dx$

$|f(x)| = \begin{cases} f(x), & f(x)>0 \\ -f(x), & f(x)<0 \end{cases}$

$\int(\text{abs}(2x-3), x, 0, 3) = 4.5$

$x^2-3x \Big|_{3/2}^{3} + 3x-x^2 \Big|_0^{3/2}$

$\cancel{[3^2-3(3)]} - \left[\left(\frac{3}{2}\right)^2 - 3\left(\frac{3}{2}\right)\right] + \left[3\left(\frac{3}{2}\right) - \left(\frac{3}{2}\right)^2\right] - 0$

$\cancel{-\frac{9}{4}} + \frac{9}{2} + \frac{9}{2} \cancel{-\frac{9}{4}}$

$-\frac{9}{2}$

4.3

$\int_a^c = \int_a^b + \int_b^c$

44. Given $\int_{-1}^{1} f(x)\,dx = 0$ & $\int_0^1 f(x)\,dx = 5$

(a) $\int_{-1}^{0} f(x)\,dx = \int_{-1}^{1} \cdots - \int_0^1 = \boxed{-5}$

(b) $\int_0^1 f(x)\,dx - \int_{-1}^{0} f(x)\,dx = \boxed{10}$

(c) $\int_{-1}^{1} 3f(x)\,dx = 3\cdot 0 = \boxed{0}$

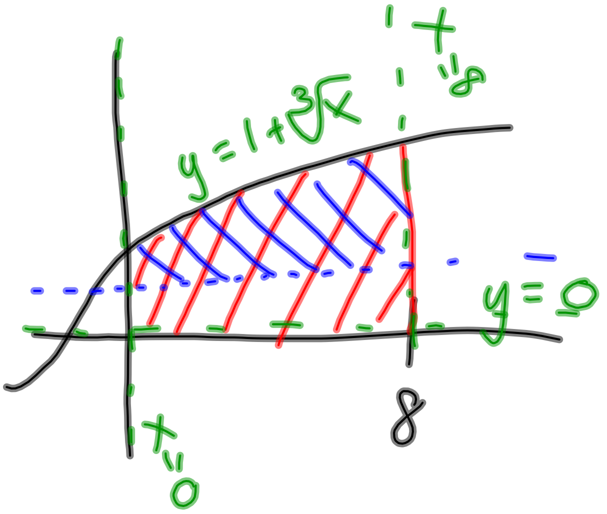
(d) $\int_0^1 3f(x)\,dx = \boxed{15}$

(e) $\int_1^0 f(x)\,dx = \boxed{-5}$

$\int_a^b = -\int_b^a$

4.4 find area of region bounded by...

42. $y = 1 + \sqrt[3]{x}$, $x = 0$, $x = 8$, $y = 0$

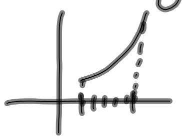


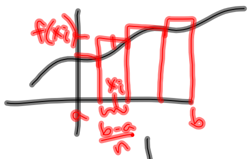
$$\int_0^8 (1 + \sqrt[3]{x})\,dx =$$

$$x + \frac{3}{4}x^{4/3} \Big|_0^8 = 20$$

43 calculate using limit def.

6. $\int_1^3 3x^2\,dx$





$$\lim_{n\to\infty} \sum_{i=1}^{n} f(x_i)\Delta x \quad , \Delta x = \frac{b-a}{n}$$

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

$$= 6 \lim_{n\to\infty} \frac{1}{n} \sum_{i=1}^{n} \left(1 + \frac{4i}{n} + \frac{4i^2}{n^2}\right)$$

$$= 6 \lim_{n\to\infty} \frac{1}{n} \left[n + \frac{4}{n} \cdot \frac{n(n+1)}{2} + \frac{4}{n^2} \cdot \frac{n(n+1)(2n+1)}{6}\right]$$

$$= 6 \lim_{n\to\infty} \left[1 + \frac{4}{n^2} \cdot \frac{n(n+1)}{2} + \frac{4}{n^3} \cdot \frac{n(n+1)(2n+1)}{6}\right]$$

$$= 6\left[1 + 2 + \frac{4}{3}\right]$$

$$= 6 + 12 + 8 = \boxed{26}$$

4.2

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

$= \lim_{n\to\infty} \frac{4}{n^2} \sum_{i=1}^{n} i$

$= \lim_{n\to\infty} \frac{4}{n^2} \cdot \frac{n(n+1)}{2} = \boxed{2}$

60. $f(y) = 4y - y^2, \quad 1 \le y \le 2$

$\lim_{n\to\infty} \sum_{i=1}^{n} \left[4\left(1+\frac{i}{n}\right) - \left(1+\frac{i}{n}\right)^2\right] \cdot \frac{2-1}{n}, \ldots$

$\int_a^b f(x)\,dx = \lim_{n\to\infty} \sum_{i=1}^{n} f\left(a + \frac{b-a}{n} i\right) \cdot \frac{b-a}{n}$

HW #20-26