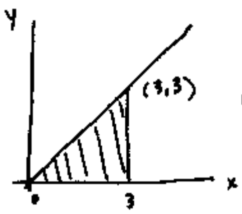
Math 1b Homework Solution set Oct. 19 - Oct. 27

§ 7.5 (17, 21, 24) § 7.6 (8, 13, 14, 21, 36, 37)

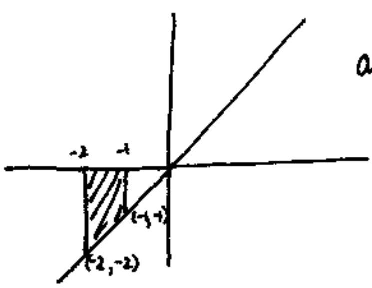
§ 7.5

17. a) $\int_0^3 x\,dx$



area $= \frac{1}{2}(3)(3) = \frac{9}{2}$ or $\int_0^3 x\,dx = \frac{1}{2}x^2\Big|_0^3 = \frac{1}{2}(9-0) = \boxed{\frac{9}{2}}$

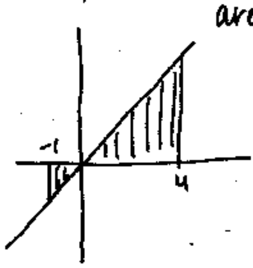
b.) $\int_{-2}^{-1} x\,dx$



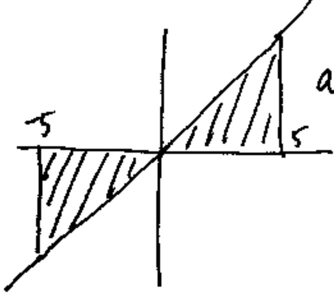
area $= \frac{1}{2}(1+2)(1) = -\frac{3}{2}$ since it is below the x-axis or $\int_{-2}^{-1} x\,dx = \frac{1}{2}x^2\Big|_{-2}^{-1} = \frac{1}{2}(1-4) = \boxed{-\frac{3}{2}}$

c.) $\int_{-1}^{4} x\,dx$

area $= -\frac{1}{2} + \frac{1}{2}(4)(4) = \frac{15}{2}$ or $\int_{-1}^{4} x\,dx = \frac{1}{2}x^2\Big|_{-1}^{4} = \frac{1}{2}(16-1) = \boxed{\frac{15}{2}}$



d.) $\int_{-5}^{5} x\,dx$



area $= -\frac{1}{2}(5)(5) + \frac{1}{2}(5)(5) = 0$ Since equal area below and above x-axis or $\int_{-5}^{5} x\,dx = \frac{1}{2}x^2\Big|_{-5}^{5} = \frac{1}{2}(25-25) = \boxed{0}$

(21.) a.) $\int_a^b f(x)dx = \boxed{0.8}$

b.) $\int_b^c f(x)dx = \boxed{-2.6}$

c.) $\int_a^c f(x)dx = 0.8 - 2.6 = \boxed{-1.8}$

d.) $\int_a^d f(x)dx = 0.8 - 2.6 + 1.5 = \boxed{-0.3}$

(24.) $\int_1^4 [3f(x) - g(x)]dx$

$= \int_1^4 3f(x)dx - \int_1^4 g(x)dx$

$= 3\int_1^4 f(x)dx - \int_1^4 g(x)dx$

$= 3(2) - 10 = \boxed{-4}$

§7.6

(8.) $\int_1^5 \frac{1}{x}dx = \ln|x|\Big|_1^5 = \ln 5 - \ln 1 = \boxed{\ln 5}$

(13.) $\int_4^9 2x\sqrt{x}dx$

$= \int_4^9 2 \cdot x \cdot x^{\frac{1}{2}}dx = \int_4^9 2 \cdot x^{\frac{3}{2}}dx = 2\int_4^9 x^{\frac{3}{2}}dx = 2\left(\frac{2}{5}\right)x^{\frac{5}{2}}\Big|_4^9$

$= 2 \cdot \frac{2}{5}\left(9^{5/2} - 4^{5/2}\right) = \frac{4}{5}(243 - 32) = \boxed{\frac{844}{5}}$

(4.) $\int_1^8 (5x^{\frac{2}{3}} - 4x^{-2})dx$

$= \int_1^8 5x^{2/3}dx - \int_1^8 4x^{-2}dx = 5\int_1^8 x^{2/3}dx - 4\int_1^8 x^{-2}dx = 5 \cdot \frac{3}{5}x^{5/3}\Big|_1^8 - 4 \cdot (-1)x^{-1}\Big|_1^8$

$= 3(8^{5/3} - 1^{5/3}) + 4(8^{-1} - 1^{-1}) = 93 + \left(-\frac{7}{2}\right) = \boxed{\frac{179}{2}}$

21. $\int_1^4 \left(\frac{3}{\sqrt{t}} - 5\sqrt{t} - t^{-3/2}\right)dt$

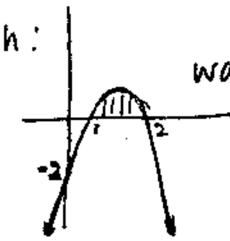
$= 3\int_1^4 t^{-1/2}dt - 5\int_1^4 t^{1/2}dt - \int_1^4 t^{-3/2}dt = 3(2)t^{1/2}\Big|_1^4 - 5\left(\tfrac{2}{3}\right)t^{\frac{3}{2}}\Big|_1^4 - (-2)t^{-1/2}\Big|_1^4$

$= 6(4^{1/2} - 1^{1/2}) - 10/3\,(4^{3/2} - 1^{3/2}) + 2(4^{-1/2} - 1^{-1/2}) = 6(1) - 10/3\,(7) + 2(-1/2) = \boxed{\frac{-55}{3}}$

36. $y = (1-x)(x-2) = -x^2 + 3x - 2 \rightarrow$ parabola

x intercepts @ $x = 1, 2$

@ $x = 0$ $y = -2$ $\therefore$ graph:

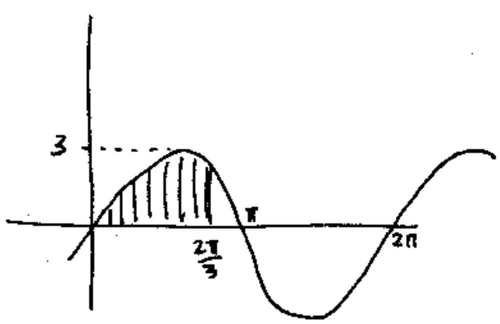


want shaded region

$\therefore \int_1^2 (1-x)(x-2)\,dx = \int_1^2 (-x^2 + 3x - 2)\,dx = -\frac{1}{3}x^3 + \frac{3}{2}x^2 - 2x\Big|_1^2$

$= \left[-\frac{1}{3}(2)^3 + \frac{3}{2}(2)^2 - 2(2)\right] - \left[-\frac{1}{3}(1)^3 + \frac{3}{2}(1)^2 - 2(1)\right] = -\frac{8}{3} + 2 + \frac{5}{6} = \boxed{\frac{1}{6}}$

37. $y = 3\sin x$ over $[0, 2\pi/3]$



$\int_0^{2\pi/3} 3\sin x\,dx = -3\cos x\Big|_0^{2\pi/3}$

$= -3\left(\cos 2\pi/3 - \cos 0\right) = -3\left(-\frac{1}{2} - 1\right)$

$\boxed{= \frac{9}{2}}$