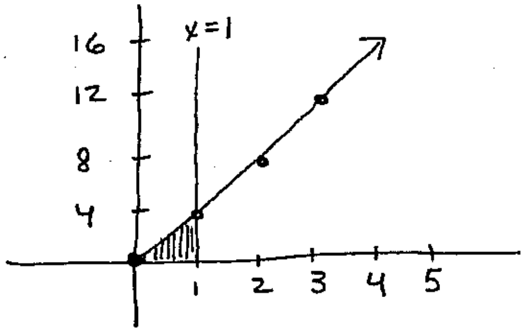
ASSIGNMENT 12 SOLUTIONS
NYA ELECTRO

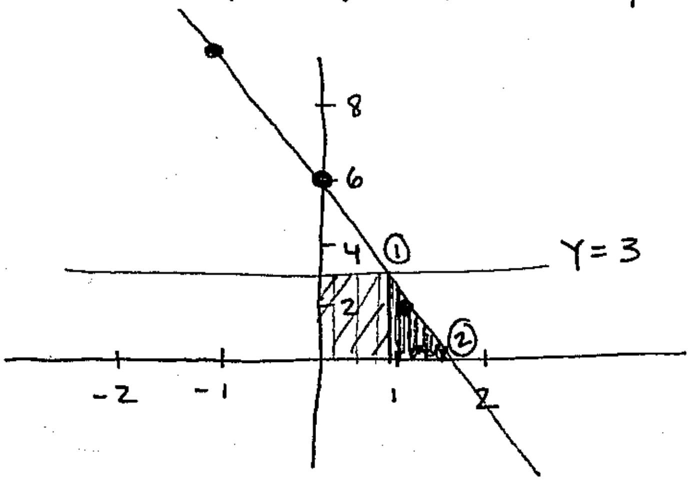
P. 769

#3 $Y = 4x$ $Y = 0$ $x = 1$



$$\text{AREA} = \int_0^1 4x\,dx$$
$$= 2x^2 \Big|_0^1$$
$$= \boxed{2}$$

#5 $Y = 6 - 4x$ $x = 0$ $y = 0$ $Y = 3$



INTERSECTIONS

① $Y = 3$ $Y = 6 - 4x$

$3 = 6 - 4x$

$-3 = -4x$

$x = 3/4$

② $Y = 0$

$Y = 6 - 4x$

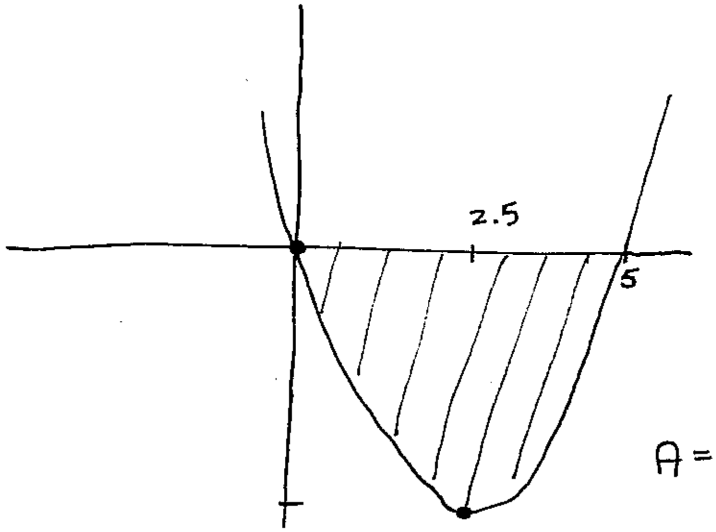
$+4x = 6$

$x = 6/4$

$= 3/2$

$$A = \int_0^{3/4} 3\,dx + \int_{3/4}^{3/2} 6 - 4x\,dx$$
$$= 3x \Big|_0^{3/4} + 6x - 2x^2 \Big|_{3/4}^{3/2}$$
$$= \left(9/4\right) + \left[\left(9 - 9/2\right) - \left(9/2 - 9/8\right)\right]$$
$$= 9/4 + 9/8 = \boxed{27/8}$$

#8 $Y = X^2 - 5X \quad Y = 0$



$Y = x^2 - 5x$

vertex : $-b/2a = 5/2 = 2.5$

$X = 2.5 \quad Y = -6.25$

$Y = x(x-5)$

TOP BOTTOM

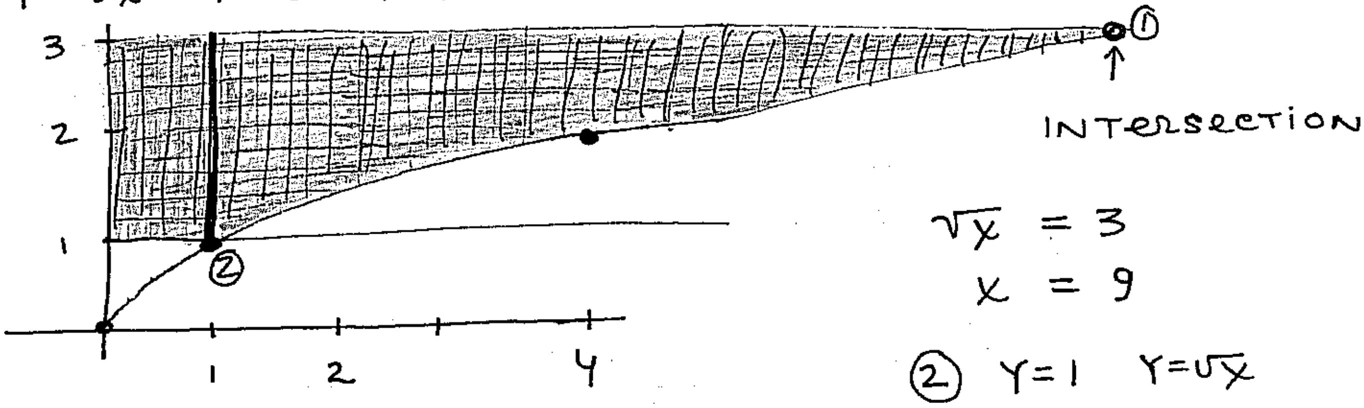
$$A = \int_0^5 0 - (x^2 - 5x)\,dx$$

$$= \int_0^5 -x^2 + 5x \,dx$$

$$= -x^3/3 + 5x^2/2 \Big|_0^5$$

$$= -125/3 + 125/2 = \boxed{125/6}$$

#11 $Y = \sqrt{x} \quad x = 0 \quad Y = 1 \quad Y = 3$



$\sqrt{x} = 3$

$x = 9$

2 $Y = 1 \quad Y = \sqrt{x}$

$x = 1$

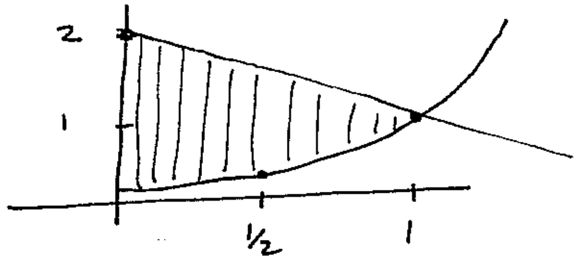
$$A = \int_0^1 3 - 1\,dx + \int_1^9 3 - \sqrt{x}\,dx$$

$$= 2x\Big|_0^1 + 3x - \tfrac{2}{3}x^{3/2}\Big|_1^9$$

$$= (2) + ((27 - 18) - (3 - 2/3))$$

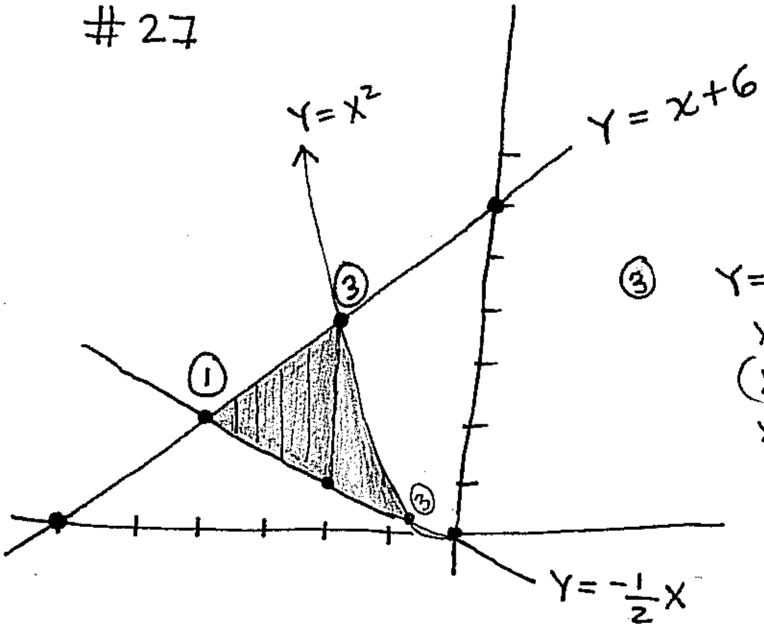
$$= \boxed{26/3}$$

\# 19 $\quad Y = X^2 \quad Y = 2 - x \quad X = 0 \quad x \geq 0$



$$A = \int_0^1 (2-x) - X^2 \, dx$$
$$= 2x - X^2/2 - X^3/3 \Big|_0^1$$
$$= \boxed{7/6}$$

\# 27



INTERSECTIONS

③ $Y = x+6$ & $Y = X^2$
$X^2 - x - 6 = 0$
$(X-3)(X+2) = 0$
$X = 3$ & $X = -2$

② $Y = -\frac{1}{2}x$ & $Y = X^2$
$-\frac{1}{2}x = X^2$
$-x = 2x^2$
$2x^2 + x = 0$
$x(2x+1) = 0$
$x = 0$ & $x = -\frac{1}{2}$

① $Y = -\frac{1}{2}x$ & $Y = x+6$
$-\frac{1}{2}x = x+6$
$x = -4$

$$\text{AREA} = \int_{-4}^{-2} (x+6) - (-\tfrac{1}{2}x)\, dx + \int_{-2}^{-1/2} x^2 - (-\tfrac{1}{2}x)\, dx + \int_{-1/2}^{0} -\tfrac{1}{2}x - x^2$$
$$= \int_{-4}^{-2} \tfrac{3}{2}x + 6 \, dx \quad \int_{-2}^{-1/2} x^2 + \tfrac{1}{2}x \, dx + \int_{-1/2}^{0} -\tfrac{1}{2}x - x^2 d$$
$$= \left(\frac{3}{4}X^2 + 6X\right)\Big|_{-4}^{-2} + \left(\frac{X^3}{3} + \frac{x^2}{4}\right)\Big|_{-2}^{-1/2} + \left(\frac{-x^2}{4} - \frac{x^3}{3}\right)\Big|_{-1/2}^{0}$$
$$= \left[(-9) - (-12)\right] + \left[\left(\frac{-1}{48}\right) - \left(-5/3\right)\right] + \left[0 - \frac{1}{48}\right]$$
$$= \boxed{14/3}$$

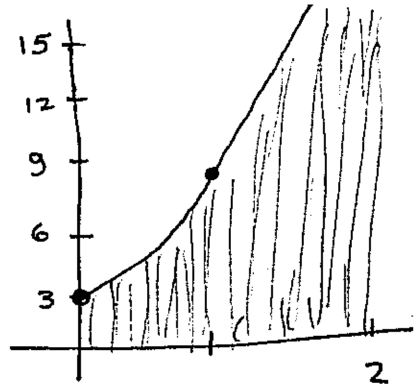
P. 838 # 31

$$\int_0^2 \frac{1}{x+1}\,dx$$

$$= \ln|x+1| \Big|_0^2$$

$$= \boxed{\ln 3}$$

P. 842



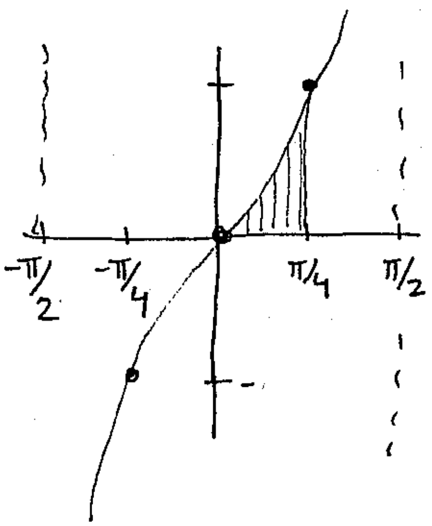
$$A = \int_0^2 3e^x\,dx$$

$$= 3e^x \Big|_0^2$$

$$= 3e^2 - 3 = \boxed{19.167}$$

P. 845 # 27

$Y = 2\tan x \quad x = \pi/4 \quad y = 0$



$$\int_0^{\pi/4} \tan x\,dx$$

$$= -\ln|\cos x| \Big]_0^{\pi/4}$$

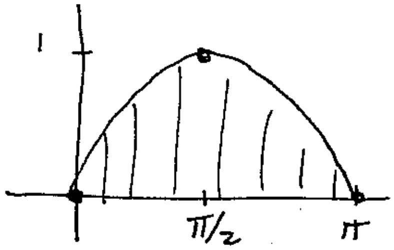
$$= -\ln\left(1/\sqrt{2}\right) + \ln(1)$$

$$= -\ln\left(1/\sqrt{2}\right)$$

$$= -(\ln 1 - \ln\sqrt{2})$$

$$= \boxed{\ln(\sqrt{2})}$$

#28 $Y = \sin x \quad x = 0 \quad x = \pi$



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

$$= 1 - (-1) = \boxed{2}$$

P. 753

#5 $\int_1^4 1 + \sqrt{x} \, dx \quad n = 6$

(a) $\Delta x = \frac{b-a}{n} = \frac{3}{6} = 0.5$

$a = 1 \quad x_1 = 1.5 \quad x_2 = 2 \quad x_3 = 2.5$

$x_4 = 3 \quad x_5 = 3.5 \quad x_6 = b = 4$

ACTUAL VALUE

(b) $\int_1^4 1 + \sqrt{x} \, dx$

$$= x + \tfrac{2}{3}x^{3/2} \Big|_1^4$$

$$= (28/3) - (5/3) = \boxed{23/3}$$

$$\int_1^4 1 + \sqrt{x} \, dx \approx 0.5\left(\frac{(1+\sqrt{1})}{2} + (1+\sqrt{1.5}) + (1+\sqrt{2}) + (1+\sqrt{2.5}) + (1+\sqrt{3}) + (1+\sqrt{3.5}) + \frac{(1+\sqrt{4})}{2}\right)$$

$$= 0.5\,(15.3229) \approx \boxed{7.66}$$

#7 $\int_2^3 \frac{1}{2x} \, dx \quad n = 2 \qquad \frac{b-a}{n} = \frac{1}{2}$

$$\approx \frac{1}{2}\left(\frac{\frac{1}{4}}{2} + \frac{1}{5} + \frac{\frac{1}{6}}{2}\right)$$

$$= 49/240 \approx \boxed{0.204}$$

#9 $\displaystyle\int_0^5 \sqrt{25-x^2}\,dx \quad n=5 \qquad \Delta x = \frac{b-a}{5} = 1$

$$\approx 1\left(\frac{\sqrt{25}}{2} + \sqrt{24} + \sqrt{21} + \sqrt{16} + \sqrt{9} + \frac{\sqrt{0}}{2}\right)$$

$$= \boxed{18.98}$$

P. 757 (SIMPSON'S RULE)

#3

(a) $\displaystyle\int_0^2 (1+x^3)\,dx \quad n=2$

$$\Delta x = \frac{2-0}{2} = 1$$

$$\approx \frac{1}{3}\left(1 + 4\left(1+(1)^3\right) + (1+2^3)\right)$$

$$= \boxed{6}$$

(b) ACTUAL

$$\int_0^2 1+x^3\,dx$$

$$= x + \frac{x^4}{4}\Big|_0^2$$

$$= 2+4$$

$$= \boxed{6}$$

#5 $\displaystyle\int_1^4 2x+\sqrt{x}\,dx \quad n=6$

$$\Delta x = \frac{4-1}{6} = \tfrac{1}{2}$$

$$\approx \frac{1/2}{3}\Big(\left(2(1)+\sqrt{1}\right) + 4\left(2(1.5)+\sqrt{1.5}\right) + 2\left(2(2)+\sqrt{2}\right) + 4\left(2(2.5)+\sqrt{2.5}\right) + 2\left(2(3)+\sqrt{3}\right)$$
$$+ 4\left(2(3.5)+\sqrt{3.5}\right) + \left(2(4)+\sqrt{4}\right)\Big)$$

$$= \frac{1}{6}\left(117.999\right) \approx \boxed{19.67}$$

(b) $\int_1^4 2x+\sqrt{x}\ dx$

$$= x^2 + \frac{2}{3}x^{3/2}\Big|_1^4$$

$$= \left(16 + 16/3\right) - \left(1 + 2/3\right)$$

$$= 59/3 \approx \boxed{19.67}$$

\# 7 $\int_0^5 \sqrt{25-x^2}\,dx \quad n=4$

$$\Delta x = \frac{5-0}{4} = 5/4 = 1.25$$

$$\approx \frac{1.25}{3}\Big(\sqrt{25} + 4\left(\sqrt{25-(1.25)^2}\right) + 2\left(\sqrt{25-(2.5)^2}\right) + 4\left(\sqrt{25-(3.75)^2}\right) + \left(\sqrt{25-5^2}\right)\Big)$$

$$= \boxed{19.272}$$