Higher Applications Revision 1.1 Solutions

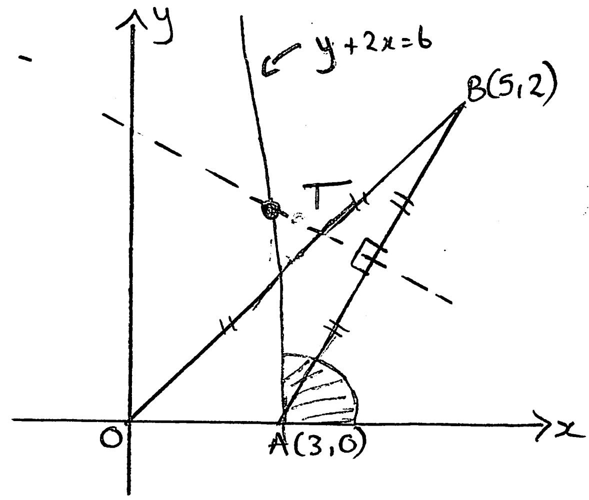
① $A(3,0)$ $B(5,2)$

(a) Perpendicular bisector of AB

$m_{AB} = \frac{2-0}{5-3} = \frac{2}{2} = 1$ $\perp m = -1$ Mid$_{AB}$ => $\left(\frac{3+5}{2}, \frac{0+2}{2}\right) = \overset{a\ b}{(4,1)}$

$y-b=m(x-a)$
$y-1=-1(x-4)$
$y-1=-x+4$
$\underline{\underline{y+x-5=0}}$

(b) $y+2x=6$ = median from A



T: Pt. of Intersection

$\ominus$ $y+x=5$
$y+2x=6$
$-x=-1$
$\underline{\underline{x=1}}$

$y+1=5$
$\underline{\underline{y=4}}$

$T=\underline{\underline{(1,4)}}$

(c) $M=\tan\theta$

AT: $y+2x=6$
$y=-2x+6$
$m=-2$

$-2=\tan\theta$ Obtuse angle
$\tan^{-1}(2)=63.4°$
$180°-63.4°=\underline{\underline{116.6°}}$

Q2. (a) L_1: $3x-4y+2=0$ $\overset{a\ b}{(-1,2)}$

$-4y=-3x-2$
$y=\frac{3}{4}x+\frac{1}{2}$ $\underline{\underline{m=\frac{3}{4}}}$

|| lines => equal gradients

$y-b=m(x-a)$
$y-2=\frac{3}{4}(x-(-1))$ $\times 4$
$\times 4$
$4y-8=3x+3$
$\underline{\underline{3x-4y+11=0}}$

(b) $PQ \perp L_2$ $\overset{a\ b}{(0,2)}$
L_2: $x-4y=10$
$-4y=-x+10$
$y=\frac{1}{4}x-\frac{10}{4}$
$m=\frac{1}{4}$
$\perp m=-4$
$y-2=-4(x-0)$
$y-2=-4x$
$\underline{\underline{y+4x-2=0}}$

(c) L_1: $3x-4y+2=0$
L_2: $x-4y=10$

Pt. of Intersection $=\underline{\underline{(-6,-4)}}$

$\ominus$ $3x-4y=-2$
$x-4y=10$
$2x=-12$
$x=-6$

$3(-6)-4y=-2$
$-18-4y=-2$
$-4y=16$
$y=-4$

Q3. $M = \tan\theta$

$M = \tan 150°$

$\tan 150° = \underline{\underline{-0.58 = m}} = \left(-\frac{1}{\sqrt{3}}\right)$

Q4. (a) Equation of QR

Q (5, 6)   P(7, 2)   PQRS = Rectangle

$QR \perp QP$

$M_{QP} = \frac{2-6}{7-5} = \frac{-4}{2} = -2$

$\perp m = \frac{1}{2}$ Use pt. Q

$y - b = m(x - a)$

$y - 6 = \frac{1}{2}(x-5)$

×2   ×2

$2y - 12 = x - 5$

$\underline{\underline{2y - x - 7 = 0}}$

(b) $x + 3y = 13$ Intersects QR at T

Find T

$$\begin{aligned} x + 3y &= 13 \\ -x + 2y &= 7 \\ \hline 5y &= 20 \\ y &= 4 \end{aligned}$$

$x + 3(4) = 13$

$x + 12 = 13$

$x = 1$

$\underline{\underline{T(1,4)}}$

Q5. ABCD = Rhombus

AD : $y = 5$

(i) $BC \perp AD$ $B = (2, 8)$

$y = 5 \Rightarrow m = 0$

$\perp m$ = undefined

$\Rightarrow$ Equation : $\underline{\underline{x = 2}}$

(ii) Pt. of Intersection = $\underline{\underline{(2, 4)}}$

Q6. (a) $3x + 2y = 5$

$2y = -3x + 5$

$y = -\frac{3}{2}x + \frac{5}{2}$

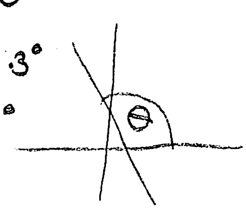
$\underline{\underline{m = -\frac{3}{2}}}$

(b) $M = \tan\theta$

$\tan^{-1}(3/2) = 56.3°$

$\theta = 180° - 56.3°$

$\theta = \underline{\underline{123.7°}}$



Q7. $x - 2y = 3$ $3y + 6x = 7$

Perpendicular $\Rightarrow$ $M_1 \times M_2 = -1$

$x - 2y = 3$

$-2y = -x + 3$

$y = \frac{1}{2}x - \frac{3}{2}$

$M_1 = \frac{1}{2}$

$3y = -6x + 7$

$y = -\frac{6}{3}x + \frac{7}{3}$

$y = -2x + \frac{7}{3}$

$M_2 = -2$

$\frac{1}{2} \times -2 = \frac{-2}{2} = \underline{\underline{-1}} \Rightarrow$ Lines are perpendicular.

⑧ (i) $E = (\overset{a}{7}, \overset{b}{7})$

$h: x - y = 2$

$y = x - 2$

$\underline{m = 1}$ $\perp m = -1$

$y - b = m(x - a)$

$y - 7 = -1(x - 7)$

$y - 7 = -x + 7$

$EG: \underline{y + x - 14 = 0}$

(ii) Pt. of Intersection

$$\begin{aligned} x - y &= 2 \\ (+)\quad x + y &= 14 \\ \hline 2x &= 16 \\ x &= 8 \end{aligned}$$

$8 - y = 2$

$-y = -6$

$y = 6$

$\underline{k(8, 6)}$

⑨ (a) Mid AB $= \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = (3\frac{1}{2}, 2\frac{1}{2})$

$\left(\frac{4 + x_2}{2}, \frac{4 + y_2}{2}\right) = (3\frac{1}{2}, 2\frac{1}{2})$

$\frac{4 + x_2}{2} = 3\frac{1}{2}$

$4 + x_2 = 7$

$x_2 = 3$

$\frac{4 + y_2}{2} = 2\frac{1}{2}$

$4 + y_2 = 5$

$y_2 = 1$

$\underline{A(3, 1)}$

(b) $M = \tan\theta$

$A(\overset{x_1}{3}, \overset{y_1}{1})$ $C(\overset{x_2}{7}, \overset{y_2}{2})$

$M = \frac{2 - 1}{7 - 3} = \frac{1}{4}$

$m = \tan\theta$

$\frac{1}{4} = \tan\theta$

$\theta = \tan^{-1}\left(\frac{1}{4}\right)$

$\underline{\theta = 14°}$

Q10. $BC: y = x + 4$

(i) AD $\quad A(3,9) \quad AD \perp BC$

$y = x + 4$
$m = 1 \quad \perp m = -1$

$y - b = m(x - a)$
$y - 9 = -1(x - 3)$
$y - 9 = -x + 3$
$AD: y = -x + 12$

(ii)
$y + x = 12$
$y - x = 4$
$2y = 16$
$y = 8$

$8 + x = 12$
$x = 4$

$(4,8)$

1.2

① (a) $2x - y + 5 = 0$

② $x^2 + y^2 - 6x - 2y - 30 = 0$

Find P and Q
$2x - y + 5 = 0$
① $y = 2x + 5$

sub. ① into ②
$x^2 + (2x+5)^2 - 6x - 2(2x+5) - 30 = 0$
$x^2 + 4x^2 + 20x + 25 - 6x - 4x - 10 - 30 = 0$
$5x^2 + 10x - 15 = 0$
$x^2 + 2x - 3 = 0$
$(x - 1)(x + 3) = 0$
$x = 1 \quad x = -3$
$y = 2(1) + 5 \quad y = 2(-3) + 5$
$y = 7 \quad y = -1$
$Q(1,7) \quad P(-3,-1)$

(b) $x^2 + y^2 - 6x - 2y - 30 = 0$
centre $= (3,1)$
radius $= \sqrt{3^2 + 1^2 + 30} = \sqrt{40} = 2\sqrt{10}$

$$\text{Mid}_{PQ} = \left(\frac{1 + (-3)}{2}, \frac{7 + (-1)}{2}\right) = (-1, 3)$$

$$(3,1) \xrightarrow{-4 \quad +2} (-1, 3) \xrightarrow{-4 \quad +2} (-5, 5)$$

radius $= 2\sqrt{10}$ (Congruent)
$(x + 5)^2 + (y - 5)^2 = (2\sqrt{10})^2$
$(x + 5)^2 + (y - 5)^2 = 400$

Q2. (a) (i) $y = 3 - x$

$x^2 + y^2 + 14x + 4y - 19 = 0$

$x^2 + (3-x)^2 + 14x + 4(3-x) - 19 = 0$

$x^2 + 9 - 6x + x^2 + 14x + 12 - 4x - 19 = 0$

$2x^2 + 4x + 2 = 0$

$x^2 + 2x + 1 = 0$

$(x+1)(x+1) = 0$

$\underline{x = -1}$ only 1 root ⇒ tangent

$y = 3 - (-1) = 4$

(ii) $\underline{P(-1, 4)}$

Q3. $x^2 + y^2 + 6x + 4y - 12 = 0$

A: Centre $= (-3, -2)$

radius $= \sqrt{3^2 + 2^2 + 12} = \sqrt{25} = 5$

$x^2 + y^2 - 6x - 12y + 20 = 0$

B: Centre $= (3, 6)$

radius $= \sqrt{3^2 + 6^2 - 20} = \sqrt{25} = 5$

(a) P = midpoint AB

$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{-3+3}{2}, \frac{-2+6}{2}\right) = \underline{(0, 2)}$

(b) $|AB| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ or $r_1 + r_2 = 5 + 5 = \underline{10}$

$= \sqrt{(3 - (-3))^2 + (6 - (-2))^2}$

$= \sqrt{36 + 64} = \sqrt{100} = \underline{10}$

Q4. $\overset{a\ b}{C(-2, 3)}$ $\overset{x\ y}{P(1, 6)}$

(a) $(x-a)^2 + (y-b)^2 = r^2$

$(1-(-2))^2 + (6-3)^2 = r^2$

$= 3^2 + 3^2 = r^2$

$18 = r^2$

$r = \sqrt{18} = 3\sqrt{2}$

$\underline{(x+2)^2 + (y-3)^2 = 18}$

(b) $P(1, 6) \xrightarrow{-3,\,-3} C(-2, 3) \xrightarrow{-3,\,-3} Q\underline{(-5, 0)}$

$M_{CQ} = \frac{0-3}{-5-(-2)} = \frac{-3}{-3} = 1$ $\perp m = -1$

$y - b = m(x - a)$

$y - 0 = -1(x + 5)$

$\underline{y = -x - 5}$

Q5. (i) Equation of C_1

$r=2$ centre $=(2,2)$

$(x-2)^2+(y-2)^2=4$

(ii) $r_{c_1}=r_{c_2}$

centre $=(3,3)$ $r=2$

$(x-3)^2+(y-3)^2=4$

1.3

Q1. $U_{n+1}=0.4U_n-5$ $U_0=8$

$U_1=0.4(8)-5=-1.8$

$U_2=0.4(-1.8)-5=-5.72$

$U_3=0.4(-5.72)-5=-7.288$

Q2. $U_1=4$ $U_2=7$ $U_3=16$

$U_{n+1}=mU_n+c$

$7=4m+c$ $-$

$16=7m+c$

$-9=-3m$

$m=3$

$7=4(3)+c$

$-5=c$

$U_{n+1}=3U_n-5$

Q3. $U_{n+1}=0.8U_n+0.5$

(a) $L=\frac{b}{1-a}=\frac{0.5}{1-0.8}=\frac{0.5}{0.2}=2\frac{1}{2}$ metres

(b) $\frac{b}{1-a}=2$

$\frac{0.5}{1-a}=2$

$\times(1-a)$ $\times(1-a)$

$0.5=2-2a$

$-1.5=-2a$

$a=0.75$

Trim trees by 25 %

Q4. $P_{n+1} = aU_n + 12$

$Q_{n+1} = 0.5U_n + 4$

same limit at $n \to \infty$, find a

$L = \frac{b}{1-a}$

$\Rightarrow$ $L = \frac{4}{1-0.5} = \frac{4}{0.5} = 8$

$L = \frac{12}{1-a} = 8$

$\times(1-a) \quad \times(1-a)$

$12 = 8 - 8a$

$4 = -8a$

$a = \underline{-0.5}$

Q5. $U_{n+1} = 0.3U_n + 35$

$L = \frac{b}{1-a} = \frac{35}{0.7} = \underline{50g}$

Yes as the maximum level the drug reaches will be $50g < 54g$.

Q6. Killpest : $U_{n+1} = 0.35U_n + 500$

Pestkill : $U_{n+1} = 0.15U_n + 650$

$L_1 = \frac{500}{1-0.35} = 769.23$

$L_2 = \frac{650}{1-0.15} = 764.71$

Pestkill will be more effective because $\underline{769.23 > 764.71}$

Q7. (d) $L = \frac{b}{1-a}$

$-1 < 0.522 < 1$

$\Rightarrow$ a limit exists

$L = \frac{25}{1-0.522}$

$L = 52.3g < 55g$

$\Rightarrow$ no maximum length of time

Poor 004 :(

Q7.

(a) 1hr $= 0.85(25) = 21.25g$ 1st dose

2hrs $= 0.85(21.25) = 18.0625$

3hrs $= 0.85(18.0625) = 15.35$

4hrs $= 0.85(15.35) = \underline{13.05g}$

(b) $13.05 + 25 = 38.05g$ after 2nd dose

5hrs $0.85(38.05) = 32.34g$

6hrs $0.85(32.34) = 27.49$

7hrs $0.85(27.49) = 23.3665$

8hrs $0.85(23.3665) \quad +25$

$\underline{19.86} < 20$

(c) $U_{n+1} = (0.85)(0.85)(0.85)(0.85)U_n + 25$

$U_{n+1} = (0.85)^4 U_n + 25$

$\underline{U_{n+1} = 0.522U_n + 25}$

He will always be above 20g after 3 doses. It really depends on how long they want to interrogate for!

$\therefore = 44.86$ after 3rd dose

after 11 hours $(0.85)^3 \times 44.86 = 38.13$

$0.85(38.13) = 32.41$

(8) $K_{n+1} = aK_n + b$

$U_1 = 6 \quad U_2 = 12 \quad U_3 = 21$

(i) $12 = 6a + b$

$\ominus \; 21 = 12a + b$

$-9 = -6a$

$a = \frac{2}{3}$

$12 = 6\left(\frac{2}{3}\right) + b$

$12 = 4 + b$

$b = 8$

(ii) $L = \frac{b}{1-a} = \frac{8}{1/3} = 24$

1.4

Q1. $y = 2x + 3 \quad y = x^3 + 3x^2 + 2x + 3$

$2x + 3 = x^3 + 3x^2 + 2x + 3$

$-2x \quad -3 \qquad\qquad -2x \quad -3$

$0 = x^3 + 3x^2$

$0 = x^2(x + 3)$

$x = 0 \quad x = -3$

$y = 3 \quad y = 2(-3) + 3$

$y = -3$

$A(0, 3) \quad B(-3, -3)$

Area $= \int$ Upper − Lower

$\Rightarrow \int_{-3}^{0} \left[(x^3 + 3x^2 + 2x + 3) - (2x + 3)\right] dx$

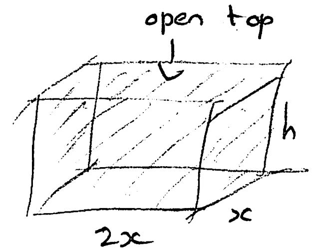
$= \int_{-3}^{0} (x^3 + 3x^2)\, dx$

$= \left[\frac{x^4}{4} + \frac{3x^3}{3}\right]_{-3}^{0} = \left[\frac{0^4}{4} + 0^3\right] - \left[\frac{(-3)^4}{4} + (-3)^3\right]$

$= [0] - \left[\frac{81}{4} - 27\right]$

$-\left[-\frac{27}{4}\right] = \frac{27}{4}$ units^2

Q.2. (a) S.A = 12 units^2



$$S.A = 2xh + 2xh + xh + xh + 2x^2$$

$$S.A = 6xh + 2x^2$$

$$12 = 6xh + 2x^2$$

$$12 - 2x^2 = 6xh$$

$$\frac{12 - 2x^2}{6x} = h$$

$$\frac{6 - x^2}{3x} = h$$

$$V = L \times B \times H$$

$$V = 2x^{\cancel{2}} \times \left(\frac{6 - x^2}{3\cancel{x}}\right)$$

$$V = \frac{12x - 2x^3}{3} = \frac{2x(6 - x^2)}{3} = \underline{\underline{\frac{2}{3}x(6 - x^2)}}$$

(b) Value for x for which volume = maximum

$0 < x < 12$

End-points

$V(0) = \frac{2}{3}(0)(6 - x^2) = 0$

$V(12) = \frac{2}{3}(12)(6 - 12^2) = -1104 \quad v < 0$

$$V(x) = \frac{2}{3}x(6 - x^2) = 4x - \frac{2}{3}x^3$$

$$V'(x) = 4 - 2x^2 = 0$$

$$4 = 2x^2$$

$$x^2 = 2$$

$$x = \pm\sqrt{2}$$

x	$-\sqrt{2}^-$ (−1.5)	$-\sqrt{2}$	$-\sqrt{2}^+$ (−1)	$\sqrt{2}^-$ (1)	$\sqrt{2}$	$\sqrt{2}^+$ (1.5)
dy/dx	−	0	+	+	0	−
Slope	\	—	/	/	—	\

$\Rightarrow$ Maximum at $\underline{\underline{x = \sqrt{2}}}$

Volume = $\frac{2}{3}(\sqrt{2})(6 - (\sqrt{2})^2 = 3.77$ units^3

Q3. Area $= \int$ Upper $-$ Lower

$$A = \int_0^5 \left[(1+10x-2x^2) - (1+5x-x^2) \right] dx$$

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

$$= \left[\frac{5x^2}{2} - \frac{x^3}{3} \right]_0^5 = \left[\frac{5(5)^2}{2} - \frac{5^3}{3} \right] - \left[\frac{5(0)^2}{2} - \frac{0^3}{3} \right]$$

$$= \frac{125}{2} - \frac{125}{3} = \underline{\frac{125}{6} \text{ units}^2}$$

Limits:

$$1 + 10x - 2x^2 = 1 + 5x - x^2$$

$$x^2 - 5x = 0$$

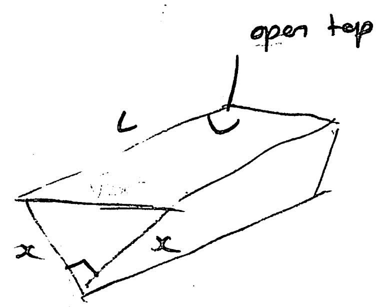
$$x(x-5) = 0$$

$$\underline{x = 0} \quad \underline{x = 5}$$

Q4. Capacity $= 108$ Litres $= 108000$ ml $= 108\,000\ \text{cm}^3$

(a) Show that S.A is

$$A(x) = x^2 + \frac{432000}{x}$$



$$V = \tfrac{1}{2} \times L \times B \times H$$

$$V = \tfrac{1}{2} \times L \times x \times x$$

$$V = \tfrac{1}{2} L x^2$$

$$108\,000 = \tfrac{1}{2} L x^2$$

$$L = \frac{216\,000}{x^2}$$

$$S.A = \tfrac{1}{2}x^2 + \tfrac{1}{2}x^2 + xL + xL$$

$$S.A = x^2 + 2xL$$

$$S.A = x^2 + 2\cancel{x}\left(\frac{216\,000}{x^{\cancel{2}}}\right)$$

$$\underline{S.A = x^2 + \frac{432000}{x}}$$

(b) $A(x) = x^2 + 432000x^{-1}$

$$A'(x) = 2x - \frac{432000}{x^2} = 0$$

$$2x^3 - 432000 = 0$$

$$2x^3 = 432000$$

$$x^3 = 216\,000$$

$$x = \sqrt[3]{216000}$$

$$\underline{x = 60}$$

x	60^-	60	60^+
dy/dx	$-$	0	$+$
Slope	\	—	/

minimum at $\underline{x = 60}$

Q5. $f(x) = x^2 + 2x$ $\quad g(x) = x^3 - x^2 - 6x$

$A(4, 24)$ $\quad O(0, 0)$

$\int$ Upper − Lower

$$\Rightarrow \int_0^4 \left[(x^2+2x) - (x^3 - x^2 - 6x)\right] dx$$

$$= \int_0^4 (2x^2 - x^3 + 8x)\, dx$$

$$= \left[\frac{2x^3}{3} - \frac{x^4}{4} + \frac{8x^2}{2}\right]_0^4 = \left[\frac{2x^3}{3} - \frac{x^4}{4} + 4x^2\right]_0^4$$

$$\Rightarrow \left[\frac{2(4)^3}{3} - \frac{4^4}{4} + 4(4^2)\right] - \left[0 - 0 + 0\right]$$

$$\Rightarrow \frac{128}{3} - 64 + 64 = \underline{\underline{\frac{128}{3}\text{ units}^2}}$$

Q6. $V = 400\,\text{cm}^3$

(a) Show $A(r) = 3\pi r^2 + \frac{800}{r}$

$V = \pi r^2 h$

$400 = \pi r^2 h$

$h = \frac{400}{\pi r^2}$

$S.A = 2\pi r^2 + \pi r^2 + 2\pi r h$

$S.A = 3\pi r^2 + 2\cancel{\pi}\cancel{r}\left(\frac{400}{\cancel{\pi} r^{\cancel{2}}}\right)$

$$\underline{\underline{S.A = 3\pi r^2 + \frac{800}{r}}}$$

(b) Minimum S.A

$A(r) = 3\pi r^2 + 800r^{-1}$

$A'(r) = 6\pi r - \frac{800}{r^2} = 0$

$6\pi r^3 - 800 = 0$

$6\pi r^3 = 800$

$r^3 = \frac{800}{6\pi}$

$r = \sqrt[3]{\frac{800}{6\pi}} = 3.5$

r	3.5^- (3)	3.5	3.5^+ (4)
dy/dr	−	0	+
Slope	\	—	/

$\Rightarrow$ minimum at $r = \underline{\underline{3.5}}$

Q7. $y = x^3 - x^2 - 6x - 2$ $\qquad$ $A(\overset{a}{1}, \overset{b}{-8})$ $\qquad$ 7.

(a) Equation of tangent at A

$dy/dx = 3x^2 - 2x - 6 \qquad x = 1$

$\Rightarrow 3(1)^2 - 2(1) - 6 = m$

$\underline{\underline{-5 = m}}$

$y - b = m(x - a)$

$y + 8 = -5(x - 1)$

$\underline{\underline{y = -5x - 3}}$

$-5x - 3 = x^3 - x^2 - 6x - 2$

$x^3 - x^2 - x + 1 = 0$

$(x-1)$ is a factor

$$\begin{array}{r|rrrr} 1 & 1 & -1 & -1 & 1 \\ & & 1 & 0 & -1 \\ \hline & 1 & 0 & -1 & \boxed{0} \end{array}$$

$x^2 - 1$

$(x-1)(x+1)(x-1) = 0$

$x = -1$ and $x = 1$

$y = -5(-1) - 3 \qquad \underline{\underline{(1, -8)}}$

$y = 2$

$B\underline{\underline{(-1, 2)}}$

(b) Shaded area $= \int$ Upper $-$ Lower

$$\int_{-1}^{1} \left[(x^3 - x^2 - 6x - 2) - (-5x - 3) \right] dx$$

$$\int_{-1}^{1} (x^3 - x^2 - x + 1)\, dx$$

$$= \left[\frac{x^4}{4} - \frac{x^3}{3} - \frac{x^2}{2} + x \right]_{-1}^{1}$$

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

$$= \left[\frac{5}{12} \right] - \left[-\frac{11}{12} \right] = \frac{16}{12} = \underline{\underline{\frac{4}{3} \text{ units}^2}}$$

Q8. $y = x^2(x-5)$

Roots : $y = 0$

$x^2(x-5) = 0$

$x^2 = 0 \quad x = 5$

$x = 0$

$$\int_0^5 (x^3 - 5x^2)\,dx$$

$$= \left[\frac{x^4}{4} - \frac{5x^3}{3}\right]_0^5$$

$$= \left[\frac{5^4}{4} - \frac{5(5)^3}{3}\right] - [0] = \frac{625}{4} - \frac{625}{3}$$

$$= -\frac{625}{12} \quad \Rightarrow \text{Area} = \frac{625}{12} \text{ units}^2$$

Q9. $y = -x^2 + 6 \qquad y = x^2 - 2$

Points of intersection :

$-x^2 + 6 = x^2 - 2$

$-2x^2 = -8$

$x^2 = 4$

$x = \pm 2$ or use graph!

(i) $$\int_{-2}^{2} \left[(-x^2+6) - (x^2-2)\right] dx$$

$$= \int_{-2}^{2} (-2x^2 + 8)\,dx$$

(ii) $$\int_{-2}^{2} (-2x^2 + 8)\,dx$$

$$= \left[\frac{-2x^3}{3} + 8x\right]_{-2}^{2}$$

$$\Rightarrow \left[\frac{-2(2)^3}{3} + 8(2)\right] - \left[\frac{-2(-2)^3}{3} + 8(-2)\right]$$

$$\Rightarrow \left[\frac{-16}{3} + 16\right] - \left[\frac{16}{3} - 16\right]$$

$$\Rightarrow -\frac{32}{3} + 32 = \frac{64}{3} \text{ units}^2$$