Date: ______

(Ans 1) $q_1 + 3.5p_1 - 0.8p_2 = 517$

$q_2 + 4.4p_2 - 1.4p_1 = 770$

$q = q_1 + q_2$ $\boxed{R = P \times q}$

$q_1 = 3.5p_1 - 0.8p^2 - 517$

$q_2 = 4.4p_2 - 1.4p_1 - 770$

$q = 3.5p_1 - 0.8p^2 - 517 + (4.4p_2 - 1.4p_1 - 770)$

$q = 3.5p_1 - 0.8p^2 - 517 + 4.4p_2 - 1.4p_1 - 770$

$R = P(3.5p_1 - 0.8p^2 - 517 + 4.4p_2 - 1.4p_1 - 770)$

$R(p_1, p_2) = 3.5p_1^2 - 0.8p_2^2 - 517p + 4.4p_2^2 - 1.4p_1^2 - 770p$

$(p_1, p_2) =$

$f(p_1) = -517 - 770 = 0$

$f(p_2) = 7p_1 - 1.6p_2 + 8.8p_2 - 2.8p_1$

$fp_2 = 4.2p_1 + 7.2p_2$

(ii) $\int_C x^7 y^3 \, ds$, $C: x = \cos^3 t$, $y = \sin^3 t$

$0 \le t \le \pi/2$

$$\int_a^b F(x,y) \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} \, dt$$

$F(x,y) = x^7 y^3$

$x(t) = \cos^3 t$
$y(t) = \sin^3 t$
$t: 0 \text{ to } \pi/2$

$f(x,y) = t = (\cos^3 t)^7 \, (\sin^3 t)^3$

$$\int_0^{\pi/2} t \sqrt{(3\sin^2 t)^2 + (3\cos t)^2}$$

$\frac{dx}{dx} = \cos$
$= -3\sin$

$$\int_0^{\pi/2} t \sqrt{9\sin t + 9\cos t}$$

$\frac{dy}{dt} = \sin$
$\frac{dy}{dt} = 3\cos$

$$\int_0^{\pi/2} \sqrt{u} \, du$$

$u = 9\sin t + \ldots$
$\cancel{du = 9\cos t +}$
$du = 9\sin t \cdot \ldots$
$9\cos t.$

$$\left[(9\sin t + 9\cos t)^{1/2} \right]_0^{\pi/2}$$

$9\sin t(\pi/2) + 9 \cos \pi/2)^{1/2}$

$9 \cancel{\text{s}} + 9$
$= 18$

Date:

Q.no.(iii) $\int_C yz\,dx \quad xz\,dy + xy\,dz$, $C: x = e^t$

$y = e^{3t}$, $z = e^{-t}$; $0 \le t \le 1$

$dx = te^t$

for $\quad dy = 3te^{3t}$

$x = 0 \quad dz = -te^{-t}$

$\int_C yz\,dx$

along y

0 to 1

$\left[(y) z\,dx + xz(3te^{3t}) + 0 \right]$

$\left[xz(3te^{3t}) \right]_1^0$

$0(z)\, 3te^{3t}$

1

$\left[(1) z\,dx + xz(3te^{3t}) + x(1) d \right.$

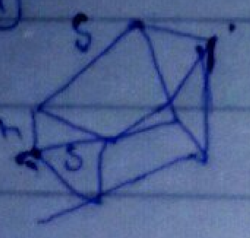
$z\,dx + xz(3te^{3t}), \quad x\,dz$

Q) Find the maximum volume of a

Maximum material used = 1

Base Must be square

Maximum volume

① 

② maximizing volume

③ $V = s^2 h$ ___ (i)

④ constraint $A = 12 = 2s^2 + 4sh$

⑤ $4sh = 12 - 2s^2$

$h = \dfrac{\cancel{12} - \cancel{2}s^2}{\cancel{4}s}$

$$\boxed{h = \frac{6 - s^2}{2s}}$$

Put in h in eq - ①

$V = \cancel{s^2}\left(\dfrac{6 - s^2}{2\cancel{s}}\right)$

$V = \dfrac{6s}{2} - \dfrac{1s^3}{2}$

⑥ $V' = \dfrac{6}{2} - \dfrac{3s^2}{2}$

(7) $\frac{\cancel{6}}{2} - \frac{3s^2}{2} = 0$

$6 - 3s^2 = 0$

$3s^2 = 6$

$s^2 = \frac{{}^{2}\cancel{6}}{{}^{1}\cancel{3}}$

$s^2 = 2$

Taking root on b.s $\sqrt{s^2} = 2$

$$\boxed{s = \sqrt{2} = 1.41}$$

$h = \frac{6 - s^2}{2s}$ — (2)

Put s in eq (2)

$h = \frac{6 - (\sqrt{2})^2}{2\sqrt{2}}$

$$\boxed{h = \frac{6 - 2}{2\sqrt{2}} = \frac{4}{2.8.2} = 1.41}$$

Date:

$$\int_0^2 \int_{4x^3-x^4}^{3-4x+4x^2} x \, dy \, dx$$

$$\int_0^2 \left[xy \right]_{4x^3-x^4}^{3-4x+4x^2}$$

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

$$\int_0^2 3x - 4x^2 + 4x^3 - 4x^4 + x^5 \, dx$$

$$\int_0^2 \frac{3x^2}{2} - \frac{4x^3}{3} + \frac{4x^4}{4} - \frac{4x^5}{5} +$$

$$\left[\frac{3(2)^2}{2} - \frac{4(2)^3}{3} + \frac{4(2)^4}{4} - \frac{4(2)^5}{5} + \right.$$

$$\frac{12}{2} - \frac{32}{3} + \frac{64}{4} - \frac{128}{5} + \frac{32}{5}$$

$$= \frac{118}{15} \text{ Ans}$$

(ii) $y = 4x^3 - x^4$ — (1)

$y = 3 - 4x + 4x^2$ — (2)

point of intersection:

$y = y$

$$4x^3 - x^4 = 3 - 4x + 4x^2$$

$$\cancel{4x^3 - x^4 - 3 + 4x - 4x^2 = 0}$$

$$4x - x^4 + 4x - 3$$

$$4x^2 - x^4 - 3 = 0$$

$$x^2(4 - x^2) - 3 = 0$$

$$\cancel{0 = 3 - 4x + 4x^2 - 4x^3 + x^4}$$

$\boxed{x = 0}$ $\quad$ $x^2 = 4$

$\boxed{x = 2}$

Test

$y = 1$

Put in (1)

$$(1)^3 - (1)^4 = 0$$

$$3 - 4(1) + 4(1)^2 = 3$$

upper is $3 - 4x + 4x^2$

Lower is $4x^3 - x^4$

Date:

$$\int_0^{1/2} \frac{7(y^{3/2})}{3} y - 7\left(\frac{y^4}{3}\right) dy$$

$$\int_0^{1/2} \frac{7 y^{5/2}}{3} - \frac{7 y^4}{3}$$

$$\int_0^{1/2} \frac{7 y^{5/2}}{3} \quad \frac{7 y^4}{3} \; d$$

$$\left[\frac{\cancel{7} y^{7/2}}{3(\cancel{7}/2)} - \frac{7 y^5}{3(5)} \right]_0^{1/2}$$

$$\left[\frac{y^{7/2}}{6} - \frac{7 y^5}{15} \right]_0^{1/2}$$

$$\frac{(1/2)^{7/2}}{6} - \frac{7(1/2)^5}{15}$$

$$\frac{(1/2)^{7/2}}{6} \qquad \frac{7(1/32)}{15} = 7/32$$

$$\frac{7}{6} - \frac{7}{480} = \frac{553}{480}$$

Q(b)(ii)

$f(x,y) = 7x^2y$

point of intersection

$x = y$ $\qquad$ $x = \sqrt{y}$

$\cancel{y=y}$ $\qquad$ $x = x$

$y = \sqrt{y}$

$y = y^{1/2}$

$\boxed{y=0}$ $\qquad$ $y = \boxed{1/2}$

Test

$y = \frac{1}{4}$

$x = \frac{1}{4}$ $\qquad$ $x = \sqrt{1/4}$

upper is $\sqrt{y}$

Lower is y

$$\int_0^{1/2} \int_y^{\sqrt{y}} 7x^2y \, dx \, dy$$

$$\int_0^{1/2} \left[\frac{7x^3}{3} y \right]_y^{\sqrt{y}} dy$$

$$\int_0^{1/2} \left[\frac{7(y^{1/2})^3}{3} y - \frac{7(}{}\right.$$