1 market demand $P = 10 - Q^2$

$Q^2 = 10 - P$

$Q = \pm\sqrt{10-P}$

$Q = \sqrt{10-P}$, $Q \geq 0$

x-int, $Q = \sqrt{10}$, $(\sqrt{10}, 0)$

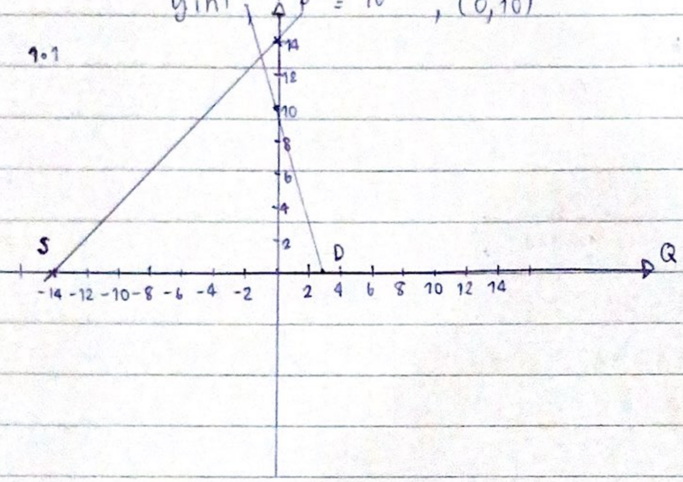
y int, $P = 10$, $(0, 10)$

market supply $Q = -14 + P$

x-int, $Q = -14$ $(-14, 0)$

y-int, $P = 14$ $(0, 14)$

1.1



1.2 Solve P^* , Q^*

Demand $Q = \sqrt{10-P}$

Supply $Q = -14 + P$

equlibrium when market Demand = market supply

$$\sqrt{10-P} = -14 + P$$

$$(\sqrt{10-P})^2 = (-14+P)^2$$

$$10 - P = P^2 - 28P + 196$$

$$P^2 - 28P + 196 - 10 + P = 0$$

$$P^2 - 27P + 186 = 0$$

$$P = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$P = \frac{27 \pm \sqrt{(-27)^2 - 4(1)(186)}}{2}$$

P is undefined

Hence, no P^* and Q^*

1.3 if market supply changed from $Q_1 = -14 + P_1$ to $Q_2 = -12 + P_2$

The result of a increased is that Quantity will be increased and supply curve shifts right. This means quantity is increased while price is reduced.

2. $R(Q) = \ln(Q^2+1) + 3\left(\frac{Q}{Q+1}\right), \quad Q \geq 0$

$$TR = \ln(Q^2+1) + 3\left(\frac{Q}{Q+1}\right)$$

$$MR = \frac{d(TR)}{dQ} = \frac{2Q}{Q^2+1} + 3\left(\frac{1(Q+1) - Q(1)}{(Q+1)^2}\right)$$

(Marginal Revenue)

$$= \frac{2Q}{Q^2+1} + \frac{3}{(Q+1)^2}$$

To find critical value

$$\frac{2Q}{Q^2+1} + \frac{3}{(Q+1)^2} = 0$$

$$2Q(Q^2+2Q+1) + 3Q^2+3 = 0$$

$$2Q^3+4Q^2+2Q+3Q^2+3 = 0$$

$$2Q^3+7Q^2+2Q+3 = 0$$

no critical value

$$\frac{d^2(TR)}{dQ^2} = \frac{2(Q^2+1) - (2Q)(2Q)}{(Q^2+1)^2} + \frac{3(-2)}{(Q+1)^3}$$

$$= \frac{2Q^2+2-4Q^2}{(Q^2+1)^2} - \frac{6}{(Q+1)^3}$$

convex or increasing gradient when $\frac{d^2(TR)}{dQ^2} > 0$

$$\frac{-2Q^2+2}{(Q^2+1)^2} - \frac{6}{(Q+1)^3} > 0$$

$$\frac{-2Q^2+2}{(Q^2+1)^2} > \frac{6}{(Q+1)^3}, \quad Q \geq 0$$

concave or decreasing gradient when $\frac{-2Q^2+2}{(Q^2+1)^2} - \frac{6}{(Q+1)^3} < 0$

$$\frac{-2Q^2+2}{(Q^2+1)^2} < \frac{6}{(Q+1)^3}, \quad Q \geq 0$$

3 $\pi(Q) = -\frac{1}{3}Q^3 - Q^2 + 8Q - 1$, solve profit maximizeng output by second derivative

$$\frac{d(\pi(Q))}{dQ} = -\frac{3}{3}Q^2 - 2Q + 8$$

$$0 = -Q^2 - 2Q + 8$$

$$Q^2 + 2Q - 8 = 0$$

$$(Q+4)(Q-2) = 0$$

$$Q = -4, 2$$

$$\frac{d^2(\pi(Q))}{dQ^2} = -2Q - 2$$

Plug $Q = 2$; $-2(2) - 2 = -6 < 0$

Hence profit maximize when quantity is 2 unit

and $\max \pi(Q) = -\frac{1}{3}(2)^3 - 2^2 + 8(2) - 1$

$$= \frac{25}{3}$$

4 4.1 $A+B = \begin{bmatrix} 8 & 9 \\ 10 & 11 \end{bmatrix} + \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$

$A+B$ does not exist because A and B have no equality of raw x column

4.2 $A \times B = \begin{bmatrix} 8 & 9 \\ 10 & 11 \end{bmatrix} \times \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$

2x2 2x3

$$= \begin{bmatrix} 8+36 & 16+45 & 24+54 \\ 10+44 & 20+55 & 30+66 \end{bmatrix}$$

$$= \begin{bmatrix} 44 & 61 & 78 \\ 54 & 75 & 96 \end{bmatrix}$$

4.3 $\det A = \begin{vmatrix} 8 & 9 \\ 10 & 11 \end{vmatrix}$

$$= 88 - 90$$

$$= -2$$

4.4 det B does not exist because B is not square matrix

4.5 det C

$105 + 48 + 72 = 225$

$$C = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \begin{matrix} 1 & 2 \\ 4 & 5 \\ 7 & 8 \end{matrix}$$

$45 + 84 + 96 = 225$

$$\det C = 225 - 225$$
$$= 0$$

5. $$u(x,y) = x^a y^b + \ln\left(\frac{x}{x+y}\right)$$

$$\frac{\partial u}{\partial x} = a x^{a-1} y^b + \frac{1}{\frac{x}{x+y}} \left(\frac{1(x+y) - (1)(x)}{(x+y)^2} \right)$$

$$\frac{\partial u}{\partial x} = a x^{a-1} y^b + \left(\frac{x+y}{x}\right)\left(\frac{y}{(x+y)^2}\right)$$

$$\frac{\partial u}{\partial x} = a x^{a-1} y^b + \left(\frac{y}{x}\right)\left(\frac{1}{(x+y)}\right)$$

$$\frac{\partial u}{\partial y} = b x^a y^{b-1} + \frac{1}{\left(\frac{x}{x+y}\right)} \frac{(0 - (1)(x))}{(x+y)^2}$$

$$= b x^a y^{b-1} + \left(\frac{x+y}{x}\right)\left(\frac{-x}{(x+y)^2}\right)$$

$$= b x^a y^{b-1} + \left(\frac{-1}{(x+y)}\right)$$