1

a)

(i) The total revenue equation is:

$$TR=P\times Q=(142-0.05Q)Q=142Q-0.05Q2TR=P\times Q=(142-0.05Q)Q=142Q-0.05Q2$$

(ii) The equation of average revenue is:

$$AR=TRQ=142Q-0.05Q2Q=142-0.05QAR=TRQ=142Q-0.05Q2Q=142-0.05Q$$

(iii) The equation of marginal revenue is:

$$MR=dTRdQ=142-0.05(2Q)=142-0.1QMR=dTRdQ=142-0.05(2Q)=142-0.1Q$$

B) The value of price when Q =1600,

$$P=142-0.05(1600)=142-80=62P=142-0.05(1600)=142-80=62$$

And

$$dQdP=-20dQdP=-20$$

The price elasticity of demand is:

$$E=dQdP\times PQ=-20\times 621600=-0.775E=dQdP\times PQ=-20\times 621600=-0.775$$

The demand is inelastic as $0.775<1$.

c) Differentiate TR w.r.t. Q,

$$dTRdQ=142-0.1QPut=0,142-0.1Q=0142=0.1Q1,420=QdTRdQ=142-0.1QPut=0,142-0.1Q=0142=0.1Q1,420=Q$$

Again differentiate w.r.t. Q,

$$d_2TRdQ_2=-0.1<0d2TRdQ2=-0.1<0$$

Thus, TR is maximum at Q = 1420.

Therefore,

$$TR=142(1420)-0.05(1420)2=201,640-100,820=\$100,820$$

2

a)

To write the equation of the demand curve for product X, we will substitute the given values of all other components in the firm's demand function:

$$Qx=1420-20Px-10Py+0.02M+0.04AQx=1420-20Px-10(40)+0.02(8,000)+0.04(1,200)Qx=1420-20Px-400+160+48Qx=1,228-20PxQx=1420-20Px-10Py+0.02M+0.04AQx=1420-20Px-10(40)+0.02(8,000)+0.04(1,200)Qx=1420-20Px-400+160+48Qx=1,228-20Px$$

b)

It is given that the price of product Y is inversely related to the quantity demanded of X since the variable for Y's price comes with a negative sign in the demand function for X. Hence, a change in the price of Y will cause a change in X's demand in the opposite direction. This indicates that X and Y are complementary goods. When the price of Y increases, the demand for X reduces, and when the price of Y decreases, the demand for X increases.

c)

Demand function for X:

$$Qx=1420-20Px-10Py+0.02M+0.04AQx=1420-20Px-10Py+0.02M+0.04A$$

At $Px==\$50Px==\$50$:

$$Qx=1420-20(50)-10(40)+0.02(8,000)+0.04(1,200)Qx=228Qx=1420-20(50)-10(40)+0.02(8,000)+0.04(1,200)Qx=228$$

Price Elasticity of Demand:

$$Ed=\partial Qx\partial Px\times PxQxEd=\partial\partial Px(1420-20Px-10Py+0.02M+0.04A)\times 50228Ed=-20\times 50228Ed=-4.39Ed=\partial Qx\partial Px\times PxQxEd=\partial\partial Px(1420-20Px-10Py+0.02M+0.04A)\times 50228Ed=-20\times 50228Ed=-4.39$$

d.)

Substituting the given values in the demand function to derive the demand equation in terms of Px:

$$Qx=1,228-20Px\Rightarrow Px=61.4-0.05QxQx=1,228-20Px\Rightarrow Px=61.4-0.05Qx$$

Total Revenue Function:

$$TRx=Px\times QxTRx=(61.4-0.05Qx)QxTRx=61.4Qx-0.05Qx2TRx=Px\times QxTRx=(61.4-0.05Qx)QxTRx=61.4Qx-0.05Qx2$$

Marginal Revenue Function:

$$MRx=ddQx(TRx)MRx=ddQx(61.4Qx-0.05Qx2)MRx=61.4-0.10QxMRx=ddQx(TRx)MRx=ddQx(61.4Qx-0.05Qx2)MRx=61.4-0.10Qx$$

Total revenue is maximized at the point where the marginal revenue becomes equal to 0:

$$MRx=00=61.4-0.10Qx61.4=0.10QxQx=614MRx=00=61.4-0.10Qx61.4=0.10QxQx=614$$

Substituting the derived quantity in the demand equation to find the price:

$$614=1,228-20Px20Px=614Px=\$30.7614=1,228-20Px20Px=614Px=\$30.7$$

Maximum Total Revenue:

$TRx=Px\times QxTRx=\$30.7\times614TRx=\$18,849.8$

3

Price elasticity of demand for Big G cereal is inelastic

Price elasticity of demand (PED) = percentage change in quantity / percentage change in price

But

percentage change in quantity = -4%

percentage change in price = 6%

Hence,

PED = -4% / 6% = -0.67%.

Since PED is less than 1, the demand is inelastic.

4.

$Ced=\text{Quantity of good X}\text{Price of good Y}Ced=\text{Quantity of good X}\text{Price of good Y}$

$5=\frac{50}{\text{Price of good Y}}5=\frac{50}{\text{Price of good Y}}$

Price of good Y=10 PercentPrice of good Y=10 Percent

The cross price elasticity of demand is negative which shows that as consumption of good X increase by 50 percent then the price of good Y falls by 10 percent. It means good X and Y are complementary of each other.