**1**

a)

(i) The total revenue equation is:

TR=P×Q=(142−0.05Q)Q=142Q−0.05Q2TR=P×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×PQ=−20×621600=−0.775E=dQdP×PQ=−20×621600=−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,

d2TRdQ2=−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=∂Qx∂Px×PxQxEd=∂∂Px(1420−20Px−10Py+0.02M+0.04A)×50228Ed=−20×50228Ed=−4.39Ed=∂Qx∂Px×PxQxEd=∂∂Px(1420−20Px−10Py+0.02M+0.04A)×50228Ed=−20×50228Ed=−4.39

d.)

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

Qx=1,228−20Px⇒Px=61.4−0.05QxQx=1,228−20Px⇒Px=61.4−0.05Qx

Total Revenue Function:

TRx=Px×QxTRx=(61.4−0.05Qx)QxTRx=61.4Qx−0.05Qx2TRx=Px×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×QxTRx=$30.7×614TRx=$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=Quantity of good XPrice of good YCed=Quantity of good XPrice of good Y

5=50Price of good Y5=50Price 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.