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BREAK EVEN POINT

EXAMPLE 1:

$$TR = -4x^2 + 72x$$

$$TC = 16x + 180$$

SOLUTION:

$$TR = -4x^2 + 72x$$

$$TC = 16x + 180$$

As we know that:

$$\text{Profit} = \pi = TR - TC$$

$$\pi = (-4x^2 + 72x) - (16x + 180)$$

$$\pi = -4x^2 + 72x - 16x - 180$$

$$\pi = -4x^2 + 56x - 180 \rightarrow \text{Profit function}$$

Now we use Quadratic formula:

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

Here:

$$a = -4, b = 56, c = -180$$

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$$= \frac{-56 \pm \sqrt{(56)^2 - 4(-4)(-180)}}{2(-4)}$$

$$= \frac{-56 \pm \sqrt{3136 - 2880}}{-8}$$

$$= \frac{-56 \pm \sqrt{256}}{-8}$$

$$= \frac{-56 \pm 16}{-8}$$

$$x = \frac{-56 + 16}{-8}, \quad x = \frac{-56 - 16}{-8}$$

$$x = \frac{-40}{-8}, \quad x = \frac{-72}{-8}$$

$$x = 5, \quad x = 9$$

Range: 5 - 9

Now:

Put values of x i-e $x = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10$ one by one in both TR and TC functions.

$$TR = -4x^2 + 72x$$

Put $x = 1$

$$TR = -4(1) + 72(1)$$

$$TR = -4 + 72$$

$$TR = 68$$

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Put $x = 2$

$$TR = -4(2)^2 + 72(2)$$

$$TR = -4(4) + 144$$

$$TR = -16 + 144$$

$$TR = 128$$

Put $x = 3$

$$TR = -4(3)^2 + 72(3)$$

$$TR = -4(9) + 216$$

$$TR = -36 + 216$$

$$TR = 180$$

Put $x = 4$

$$TR = -4(4)^2 + 72(4)$$

$$TR = -4(16) + 288$$

$$TR = -64 + 288$$

$$TR = 224$$

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Put $x = 5$

$$TR = -4(5)^2 + 72(5)$$

$$TR = -100 + 360$$

$$TR = 260$$

Put $x = 6$

$$TR = -4(6)^2 + 72(6)$$

$$TR = -144 + 432$$

$$TR = 288$$

Put $x = 7$

$$TR = -4(7)^2 + 72(7)$$

$$TR = -196 + 504$$

$$TR = 308$$

Put $x = 8$

$$TR = -4(8)^2 + 72(8)$$

$$TR = -256 + 576$$

$$TR = 320$$

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Put $x = 9$

$$TR = -4(9)^2 + 72(9)$$

$$TR = -4(81) + 648$$

$$TR = -324 + 648$$

$$TR = 324$$

Put $x = 10$

$$TR = -4(10)^2 + 72(10)$$

$$TR = -4(100) + 720$$

$$TR = -400 + 720$$

$$TR = 320$$

Now we solve for TC:

$$TC = 16x + 180$$

Put $x = 0$

$$TC = 16(0) + 180$$

$$TC = 0 + 180$$

$$TC = 180$$

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Put $x = 1$

$$TC = 16(1) + 180$$

$$TC = 16 + 180$$

$$TC = 196$$

Put $x = 2$

$$TC = 16(2) + 180$$

$$TC = 32 + 180$$

$$TC = 212$$

Put $x = 3$

$$TC = 16(3) + 180$$

$$TC = 48 + 180$$

$$TC = 228$$

Put $x = 4$

$$TC = 16(4) + 180$$

$$TC = 64 + 180$$

$$TC = 244$$

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Put $x = 5$

$$TC = 16(5) + 180$$

$$TC = 80 + 180$$

$$TC = 260$$

Put $x = 6$

$$TC = 16(6) + 180$$

$$TC = 96 + 180$$

$$TC = 276$$

Put $x = 7$

$$TC = 16(7) + 180$$

$$TC = 112 + 180$$

$$TC = 292$$

Put $x = 8$

$$TC = 16(8) + 180$$

$$TC = 128 + 180$$

$$TC = 308$$

(8)

Put $x = 9$

$$TC = 16(9) + 180$$

$$TC = 144 + 180$$

$$TC = 324$$

Put $x = 10$

$$TC = 16(10) + 180$$

$$TC = 160 + 180$$

$$TC = 340$$

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