MATH 121C Applied Calculus HW 1

What got graded: §1.1 #8, 68

§1.2 #24, 36

(8) Find the slope of $4x + 7y = 1$.

Soln: Solve for y: $y = \frac{1-4x}{7} = \underbrace{\frac{1}{7}}_{b} - \underbrace{\frac{4}{7}}_{m}x$

Answer: $-4/7$.

(68) The deer tick larvae density is related to the acorn density by the linear relationship

$$y = 34x + 230$$

y: #larvae/400m²

x: #acorns/m²

Q: How many acorns per m² would result in 1600 deer tick larvae/400 m²?

Soln

$$1000 = 34x + 230$$

$$\downarrow$$

$$770 = 34x$$

$$\downarrow$$

$$\frac{770}{34} = x$$

$$22.64 \approx x$$

So approximately 23 acorns per square meter would yield 1000 deer tick larvae per 400 m^2 the following spring. ▣

(24) Find the linear cost function for

- Fixed costs: $35
- 8 items cost $395 to produce

Soln:

$$C(x) = mx + b$$

mx: marginal cost (cost to make 1 item)

b: fixed cost

So $b = 35$, so the cost function looks like

$$C(x) = mx + 35.$$

Now $C(8) = 395$ so we plug this in

$$395 = m8 + 35$$

and solve for m:

$$360 = 8m$$

$$\downarrow$$

$$45 = m$$

So the cost function is

$$C(x) = 45x + 35$$

(36) Producing x units of tacos costs

$$C(x) = 5x + 20.$$

Revenue is $R(x) = 15x$.

(a) Break-even point?

(b) What's the profit from 100 units?

(c) How many units will produce $500 profits?

Soln: (a) $C(x) = R(x)$ ← the break-even equation

$$5x + 20 = 15x$$

$$\downarrow$$

$$20 = 10x$$

$$\downarrow$$

$$2 = x$$

So 2 units of tacos to break even.

(b) $P(x) = R(x) - C(x)$

$\uparrow \quad \uparrow \quad \uparrow$

Profit = Rev − Cost $= 15x - (5x + 20)$

$=$

$10x - 20$

So $P(100) = 10 \cdot 100 - 20 = \$980$

$\uparrow$

profit from selling 100 units

(c) $P(x) = 500$ (find x)

$$10x - 20 = 500$$

$$10x = 520$$

$$x = 52$$

So 52 units will profit us \$500.