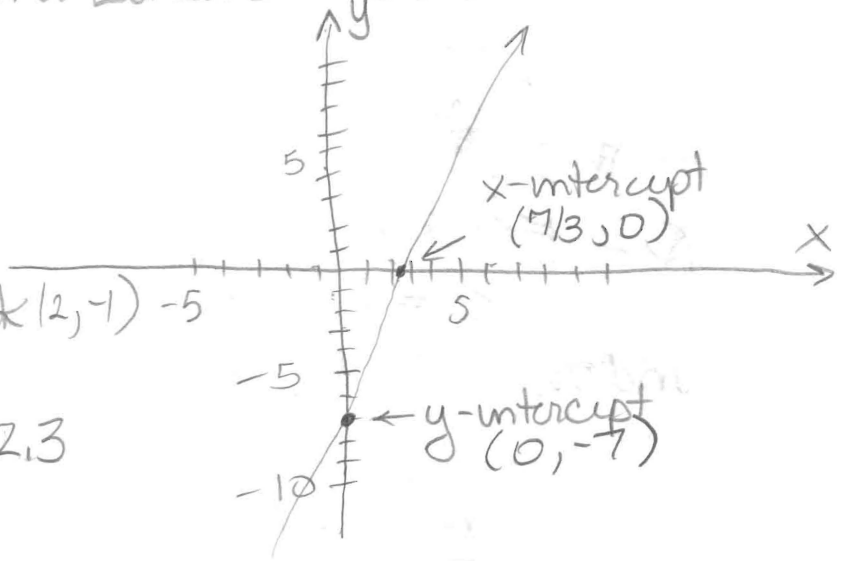
Part I – Lines and Linear Models

① $y - y_1 = m(x - x_1)$
$y - (-4) = 3(x - 2)$
$y + 1 = 3x - 6$
$y = 3x - 7$ check (2, -1)
$x = 0 \Rightarrow y = -7$
$y = 0 \Rightarrow x = 7/3 \approx 2.3$



② Demand: $(x, p) = (20, 45)$ and $(20+30, 45-15) = (50, 30)$

$$m = \frac{\Delta y}{\Delta x} = \frac{\Delta p}{\Delta x} = \frac{45 - 30}{20 - 50} = \frac{15}{-30} = -\frac{1}{2}$$

$y - y_1 = m(x - x_1)$ or $p - p_1 = m(x - x_1)$
$p - 45 = (-1/2)(x - 20) \Rightarrow p = D(x) = -1/2\,x + 55$ (define units)
check with original data; $45 \stackrel{?}{=} -1/2(20) + 55$ ✓
50 purses $\Rightarrow x = 50 \Rightarrow p = -1/2(50) + 55 = 30 \Rightarrow \$30$

③ $C(x) = cx + F$ with c cost each & F fixed cost
$C(x) = 0.5x + 600$ with x = # of stickers
and C the TOTAL cost in $ to make x stickers
$R(x) = 2x$ = total revenue $ from selling stickers
BE @ $R = C$ or $P = 0$
$2x = .5x + 600 \Rightarrow x = 400$
$R(400) = 2(400) = 800 = C(400) = (.5)(400) + 600$
At the break-even point, 400 bumper stickers are made and sold. The profit is $0, the revenue and costs are $ 800

④ # of wdgts in L_1 and price per wdget in L_2

STAT → CALC → LinReg → $y = 3.1632... x + 13.9922...$

Lowest price @ $x = 0$ ⇒ $y = 13.9922...$

⇒ \$13.99.

$p = 50 = 3.1632... x + 13.9922...$

$\Rightarrow x = 11.383... \Rightarrow$ 11 wdgts

window 0 to 20 and 0 to 100

watch units of x is in 1000's of wdgets,

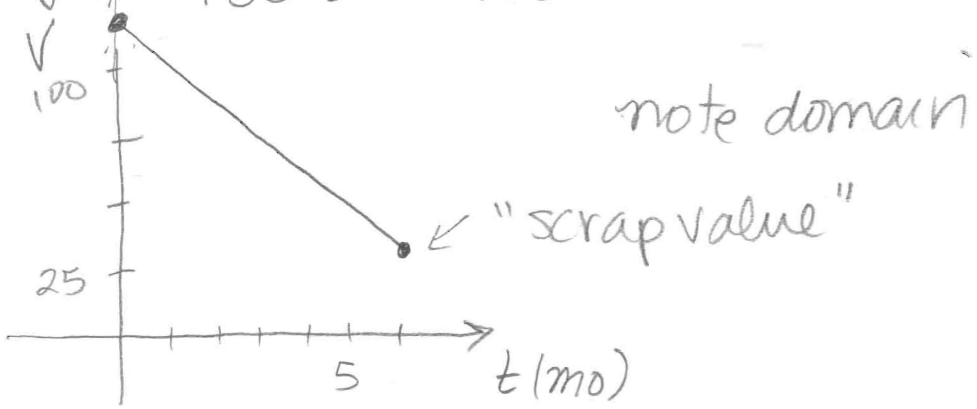
$x = 11.383 \Rightarrow$ 11,383 wdgets

⑤ $(t, V) = (0, 120)$ and $(6, 30)$ with t in months and V in dollars

$V = -15t + 120$

OR $(0, 120)$ and $(.5, 30)$ with t in years

$V = -180t + 120$

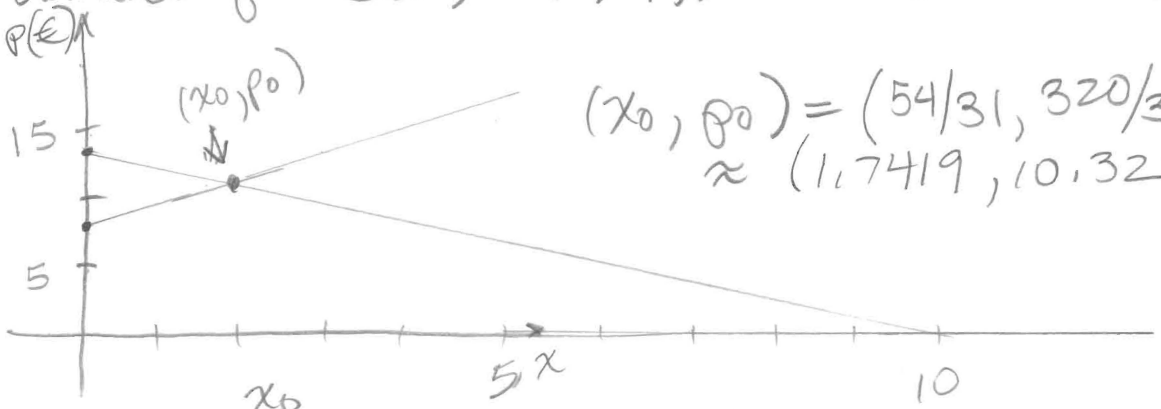


note domain

↙ "scrap value"

6. $3p - 4x = 24$ (S) x in th of lamps
$4p + 5x = 50$ (D) p price per lamp in €

supply $= p = S(x) = (4/3)x + 8$ } window 0 to 15
demand $= p = D(x) = (-5/4)x + 12.5$ } 0 to 20



$(x_0, p_0) = (54/31, 320/31)$
$\approx (1.7419, 10.3226)$

qty $= 1.7419\ldots \times 1000 = 1741.935 \Rightarrow 1742$ lamps
price $= 10.32$€ or 10.32 euros

At equilibrium point the supply of lamps is equal to the demand for lamps. So 1742 lamps are produced and sold at a price of 10.32 euros each.

7. $3y - 4x = 16 \Rightarrow 3y = 4x + 16 \Rightarrow y = (4/3)x + 16/3$

a) parallel $m = 4/3$, $y - 4 = (4/3)(x - (-3))$
$y = (4/3)x + 4 \quad +4 = (4/3)x + 8$

b) perp $m = -1/(4/3) = -3/4$
$y - (-6) = -3/4\,(x - 4)$
$y + 6 = -3/4\,x + 3$
$y = -3/4\,x - 3$