(8-6) Variation Functions - Day 2 thr p445

1 a) Let S = safeload
b = breadth
d = depth
L = length

$$S = \frac{Kbd^2}{L}$$

$$1000 = \frac{K(2)8^2}{16}$$

$$K = 125$$

$$\boxed{S = \frac{125bd^2}{L}}$$

b) $$S = \frac{125(8)(2)^2}{16}$$

$$= \boxed{250 \text{ lbs}}$$

c) Beams can support more weight.

d) 12,000

e) i) $$S_{new} = \frac{125(2b)d^2}{L}$$

$$= \frac{2(125bd^2)}{L}$$

$$= 2(S_{old})$$

twice

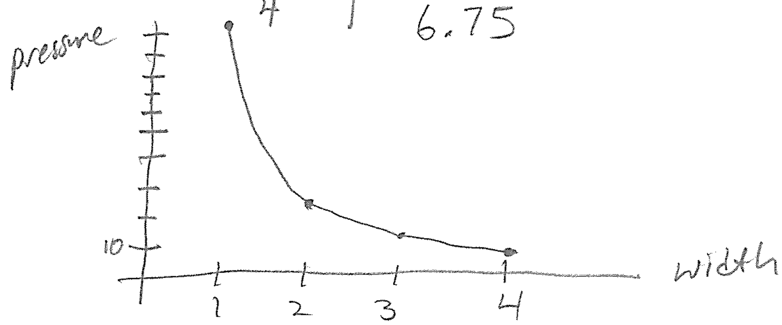
3 Let p = pressure
W = weight
d = heel width

$$P = \frac{KW}{d^2}$$

a) $$\boxed{p = \frac{1.08W}{d^2}}$$

b)

d (width)	pressure
1	108
2	27
3	12
4	6.75



(5) Let W = load
d = diameter
L = length

a) $W = \frac{K_1 d^4}{L^2}$ OR $\rightarrow K = \frac{W L^2}{d^4}$

$4 = \frac{K\, 2^4}{3^2}$

$K = 2.25$

$$W_b = \frac{2.25 d^4}{L^2}$$ buckle

b) $W = K_2 d^2$

$5 = K_2\, 2^2$

$K_2 = \frac{5}{4}$

$$W_c = \frac{5d^2}{4}$$ crush

c)

L	W (buckle)
20	900
30	400
50	144

d) $W = \frac{5(20)^2}{4}$

$W = 500$ tons

g) $W_b = W_c$

$W_c = \frac{5(20)^2}{4}$

$W_c = 500$

$500 = \frac{2.25(20)^4}{L^2}$

$L^2 = \frac{2.25(20)^4}{500}$

$L \approx 26.8$ ft.

8.6

⑦ a) Let c = current (ma)
t = time (ms)

(t, c)
$(2, 30)\ (4, 20)$

$$c \geq K_1 + \frac{K_2}{t}$$

$$30 = K_1 + \frac{K_2}{2}$$

$$- \quad 20 = K_1 + \frac{K_2}{4}$$

$$10 = \frac{K_2}{4}$$

$$K_2 = 40$$

$$20 = K_1 + \frac{40}{4}$$

$$K_1 = 10$$

$$\boxed{c \geq 10 + \frac{40}{t}}$$

t	c
1	50
2	30
4	20
5	18
10	14
40	11
∞	10

b) $c \geq 10 + \frac{40}{10}$

$c \geq 14$ ma

c) $100 \geq 10 + \frac{40}{t}$

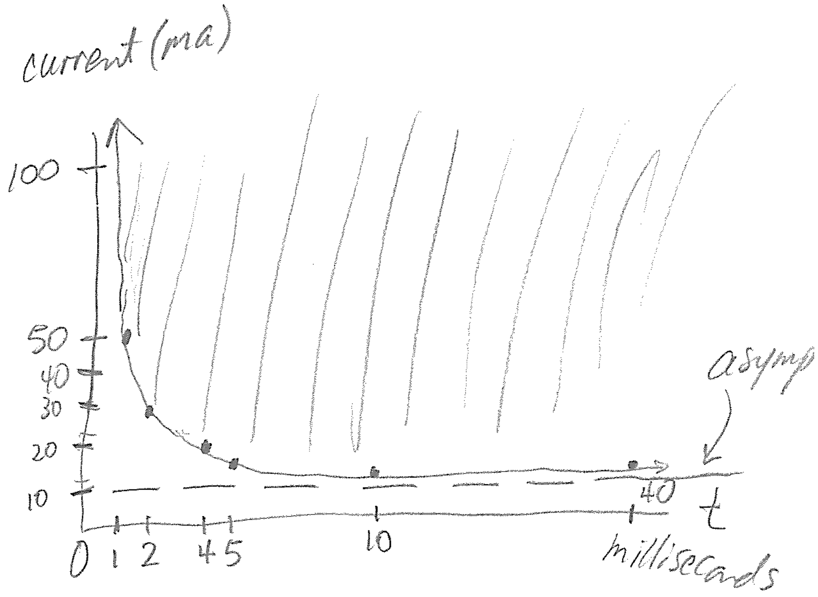
$90 \geq \frac{40}{t}$

$t \geq \frac{40}{90} \rightarrow \boxed{\frac{4}{9} \text{ m.sec}}$

d) $c \geq 10 + \frac{40}{t}$

Analyze EQ ↺
As $t \rightarrow$ very big, $\frac{40}{t}$ gets smaller.
∴ c approaches 10. (10ma)

e)



9. Composite

a) Let r = wind resistance
s = speed
m = gas mileage

$r = K_1 s^2$

$m = \frac{K_2}{r}$

get m = s:

$m = \frac{K_2}{K_1 s^2}$

$$\boxed{m = \frac{K_3}{s^2} \text{ where } K_3 = \frac{K_2}{K_1}}$$

b) varies inversely with square of speed

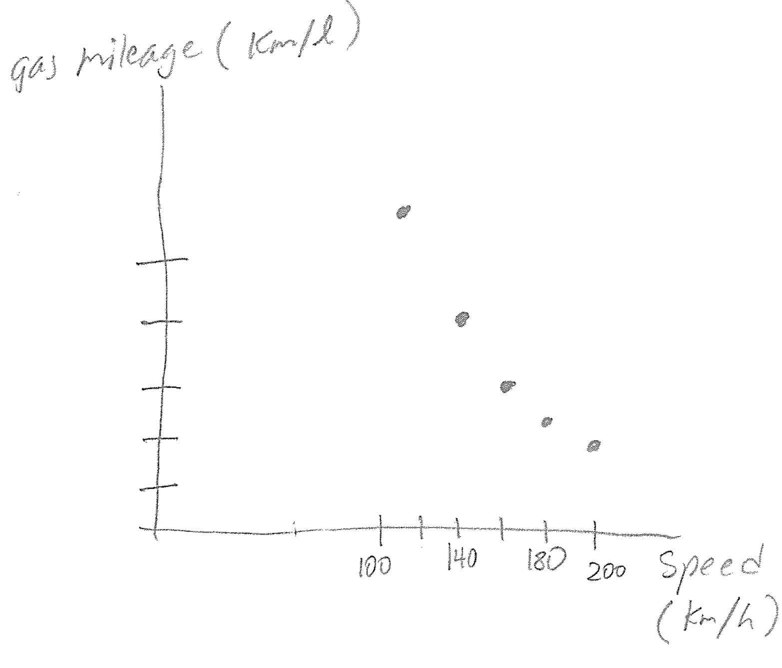
c) $8 = \frac{K_3}{100^2}$

$K_3 = 80{,}000$

$$\boxed{m = \frac{80{,}000}{s^2}}$$

d)

S	km/l
120	5.56
140	4.08
160	3.125
180	2.5
200	2



e) You'll get very little gas mileage: 2 km/l

f)

S	km/l
50	32
40	50
30	88.9
20	200

No. Friction & heat losses will minimize km/l.