Thermo Dynamics

$$P = \frac{RT}{V-b} - \frac{a}{V^2}$$

Solve for T.

if $\begin{cases} P = 10, \\ V = 5, \\ a = 1, \\ b = 2, \\ R = 3 \end{cases}$, find T

$$P + \frac{a}{V^2} = \frac{RT}{V-b} = \left(\frac{R}{V-b}\right) \cdot T$$

$$\frac{V-b}{R}\left[P + \frac{a}{V^2}\right] = T$$

sub: $\frac{5-2}{3}\left(10 + \frac{1}{25}\right) = (1)(10.001) \simeq 10.001$

electricity : capacitors

$$\frac{1}{C} = \frac{1}{C_2} + \frac{1}{C_1 + C_3}$$

Solve for C_1

$$\frac{C_2}{C_2}\frac{1}{C} - \frac{1}{C_2}\frac{C}{C} = \frac{1}{C_1 + C_3}$$

$$\frac{C_2 - C}{C_2 C} = \frac{1}{C_1 + C_3}$$

$$\frac{C_2 C}{C_2 - C} = C_1 + C_3 \Rightarrow \boxed{\frac{C_2 C}{C_2 - C} - C_3 = C_1}$$

$\frac{1}{2} = \frac{2}{4} \Leftrightarrow \frac{2}{1} = \frac{4}{2}$

For $C_2 = 5$, $C = 2$, $C_3 = 1$

$\Rightarrow \frac{5 \cdot 2}{5-2} - 1 = \frac{10}{3} - 1$

$= 3,\overline{3} - 1$

$= 2,3$

BEAM DESIGN

$$D = \frac{wx^4}{24EI} - \frac{4wLx^3}{4\,6\,EI} + \frac{6wL^2x^2}{6\,4\,EI}$$

Solve for w.

$\frac{D}{A} \cdot D$ $= w \cdot \frac{A}{B} \cdot \frac{B}{A}$

$$\frac{D}{1} = \frac{wx^4 - 4wLx^3 + 6wL^2x^2}{24EI} = \frac{w\left(x^4 - 4Lx^3 + 6L^2x^2\right)}{24EI}$$

$$\frac{D \cdot 24EI}{x^4 - 4Lx^3 + 6L^2x^3} = w$$

Your boat travels on flatwater at 5 km/h. You go up river, for 5 k. The current is pushing at v km/h. Then you go downriver for 5k. How long did it take you?

$D = RT.$

upstream travel time

$T_u = \frac{D}{R} = \frac{5}{v-5}$

downstream travel time

$T_b = \frac{D}{R} = \frac{5}{v+5}$

$$T = T_u + T_b = \frac{5}{v-5} + \frac{5}{v+5} = \frac{5(v+5) + 5(v-5)}{v^2-25}$$

$$= \frac{5v+25+5v-25}{v^2-25}$$

$$= \frac{10v}{v^2-25}$$