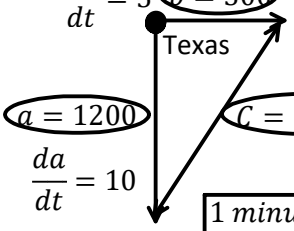
C12 - 4.3 - Pythag/Distance/Drop Eq Rel Rates Notes

Train 'a' leaves Texas heading South at 10 m/s and train 'b' leaves heading East at 5 m/s, 1 minute later? How far are they apart 1 minute after train 'b' departed? How fast are the trains are moving apart at that time?

$\frac{db}{dt} = 5$ $b = 300$ $\frac{dc}{dt}|_{t=2} = ?$



$a = 1200$ $C = 1236.9$ $\frac{da}{dt} = 10$

$a^2+b^2 = c^2$

$2a\frac{da}{dt} + 2b\frac{db}{dt} = 2c\frac{dc}{dt}$

$2(1200)(10) + 2(300)(5) = 2(1136.9)\frac{dc}{dt}$

$27000 = 2473.9\frac{dc}{dt}$

$\frac{dc}{dt} = 10.9\frac{m}{s}$

$a^2 + b^2 = c^2$

$1200^2 + 300^2 = c^2$

$c = 300\sqrt{17}$

$c = 1236.9$

$27000 = 600\sqrt{17}\frac{dc}{dt}$

$\frac{dc}{dt} = \frac{27000}{600\sqrt{17}}$

$\frac{dc}{dt} = \frac{45}{\sqrt{17}}\frac{m}{s}$ Exact Value

$1\ minutes = 60\ seconds$

$a = vt$ $\boxed{d = vt + d_i}$ $b = vt$

$a = 10 \times 60 + 10 \times 60$ $b = 5 \times 60$

$a = 1200$ $b = 300$

Distance Between.

$\frac{da}{dt} = 25\frac{km}{hr}$ $\frac{dc}{dt}_{|t=1pm} = ?$

$a^2+b^2 = c^2$

$2a\frac{da}{dt} + 2b\frac{db}{dt} = 2c\frac{dc}{dt}$

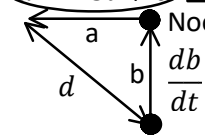
$\boxed{y = mx + b}$

$d = vt$ $d = d + vt$

$a = 25(1)$ $b = 40 - 20(1)$

$a = 25$ $b = 20$

$d = 25t + 0$ $\boxed{d_f = d_i + vt}$



$\frac{db}{dt} = -20\frac{km}{hr}$ $b = -20t + 40$

$2(25)(25) + 2(20)(-20) = 2(32.0)\frac{dc}{dt}$

$\frac{dc}{dt} = 7.03\frac{km}{hr}$

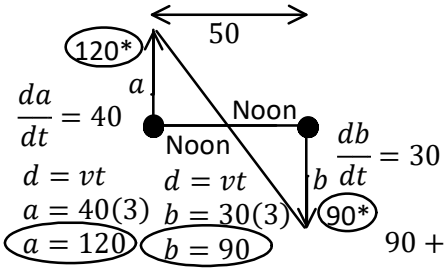
$a^2 + b^2 = c^2$

$25^2 + 20^2 = c^2$

$c = 32.0$

Didn't need equations explicitly.

Noon-3pm. Distance Between Rate? Units



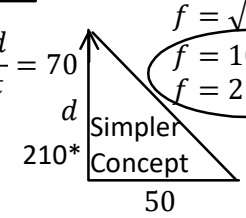
$\frac{da}{dt} = 40$ $\frac{db}{dt} = 30$

$d = vt$ $d = vt$

$a = 40(3)$ $b = 30(3)$

$a = 120$ $b = 90$

$90 + 120 = 210$ $30 + 40 = 70$



$\frac{dd}{dt} = 70$

$f = \sqrt{50^2 + 210^2}$

$f = 10\sqrt{466}$

$f = 215.87$

$e^2+d^2 = f^2$

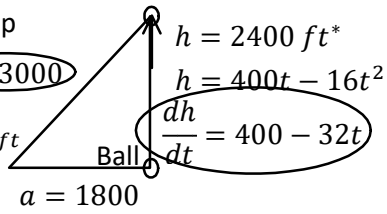
$2e\frac{de}{dt} + 2d\frac{dd}{dt} = 2f\frac{df}{dt}$

$2(210)(70) + 0 = 2\left(10\sqrt{466}\right)\frac{df}{dt}$

$\frac{df}{dt} = \frac{1470}{\sqrt{466}} = 68.1$

Ball Shot Up

$\frac{dc}{dt}\Big|_{h=2400\ ft} = ?$ $c = 3000$



$h = 2400\ ft^*$

$h = 400t - 16t^2$

$\frac{dh}{dt} = 400 - 32t$

$a^2+h^2 = c^2$

$2(1800)(0) + 2h\frac{dh}{dt} = 2c\frac{dc}{dt}$

$2(2400)(400 - 32t) = 2(3000)\frac{dc}{dt}$

$\frac{dc}{dt} = \pm 64\frac{ft}{s}$

$h = 400t - 16t^2$

$2400 = 400t - 16t^2$

... Quadform

$t = 10,15$

$a^2 + b^2 = c^2$

$c = 3000\ ft$