Exam 1 Fall 2018 Solutions

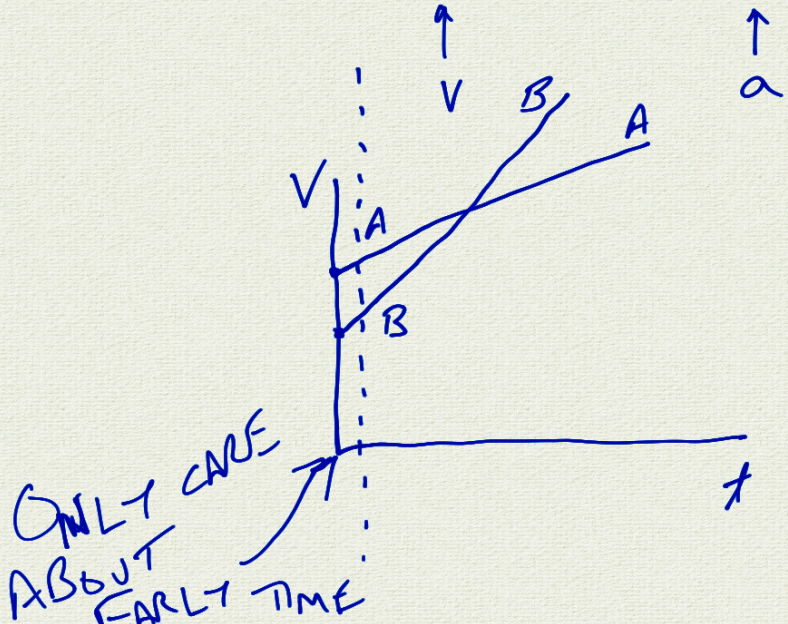
Scott N. Walck

September 14, 2020

Q1)

A 60 Km/h 40 Km/h/MIN

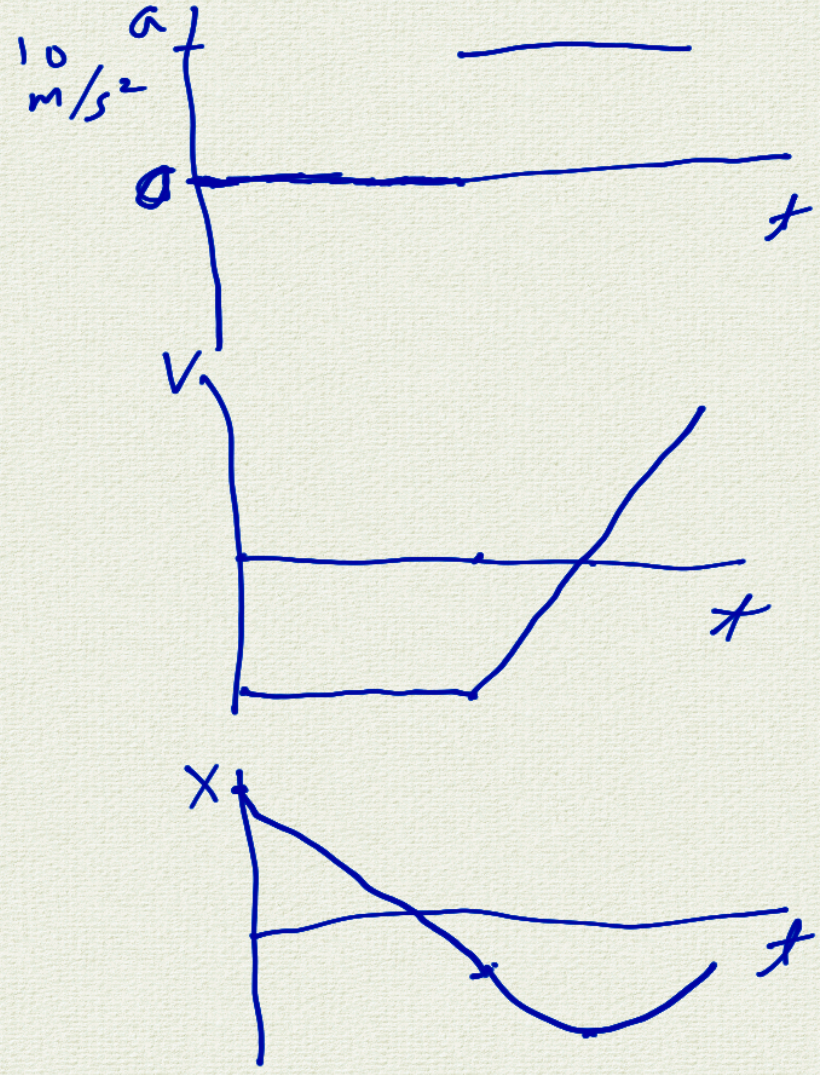
B 40 Km/h 60 Km/h/MIN



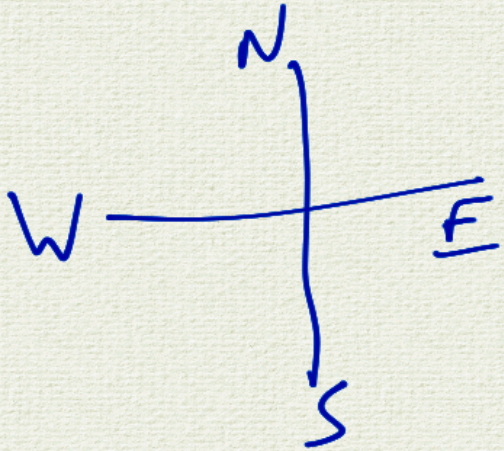
TO PASS, YOU NEED TO BE GOING FASTER. VELOCITY MATTERS, ACCELERATION DOES NOT.

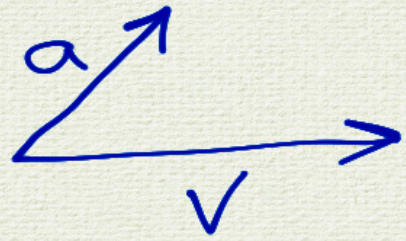
A IS PASSING B.

Q2)



Q3)





Q4

(a) YES, IF THE VECTOR LIES ALONG ONE OF THE COORDINATE AXES.

(b) NO. THE MAGNITUDE CAN NEVER BE LESS THAN A COMPONENT, THIS WOULD BE LIKE THE HYPOTENUSE BEING SHORTER THAN A LEG IN A RIGHT $\triangle$.

P1 $v = 60 \frac{\text{MILES}}{\text{HR}} \times \frac{1609\ \text{m}}{1\ \text{MILE}} \times \frac{1\ \text{HR}}{3600\ \text{s}} = 26.8\ \text{m/s}$

$$a = \frac{26.8\ \text{m/s} - 0\ \text{m/s}}{3.5\ \text{s}} = 7.66\ \text{m/s}^2$$

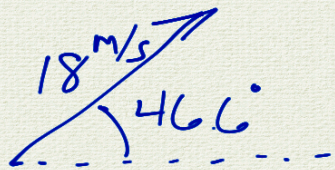
$$x = x_0 + v_0 t + \frac{1}{2} a t^2$$

$$= 0 + 0 + \frac{1}{2}(7.66\ \text{m/s}^2)(3.5\ \text{s})^2$$

$$= 46.9\ \text{m}$$

46.9 m

P2



$V_{x0} = (18\,m/s)\cos 46.6° = 12.37\,m/s$

$V_{y0} = (18\,m/s)\sin 46.6° = 13.08\,m/s$

$$y = y_0 + V_{y0}t + \frac{1}{2}a_y t^2$$

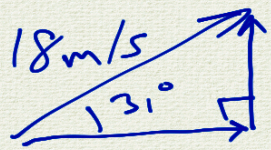
$$0\,m = 0.847\,m + (13.08\,m/s)t + \frac{1}{2}(-9.8\,m/s^2)t^2$$

QUADRATIC FORMULA $\Rightarrow$ $t = -0.06\,s,\ 2.73\,s$

$$x = x_0 + V_{x0}t + \frac{1}{2}a_x t^2$$

$$= 0\,m + (12.37\,m/s)(2.73\,s) = \boxed{33.8\,m}$$

P3]



$V_{x_0} = (18\,m/s)\cos 31° = 15.43\,m/s$

$V_{y_0} = (18\,m/s)\sin 31° = 9.27\,m/s$

$y = y_0 + V_{y_0}t + \frac{1}{2}a_y t^2$

$0_m = 0_m + (9.27\,m/s)t + \frac{1}{2}(-9.8\,m/s^2)t^2$

$t = \boxed{1.89\,s}$