

Physics 10154 - Exam #2D

Each problem is worth 50 points. Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work (or if some parts are incorrect) even if you get the right answer. Clearly indicate your answer with a circle or box and remember to include correct units and significant figures.

1. Nelson is walking North at 3.5 mi/hr along University starting from Berry, about 2.0 miles South of I-30. Sally is 3.0 miles North of I-30, and she begins walking South at 3.2 mi/hr.

Do they meet North or South of I-30? How far away from I-30 do they meet, in miles?

$$\text{Total distance} = 5.0 \text{ miles}$$

From Nelson's perspective, Sally is walking

$$6.7 \text{ mi/hr}$$

$$t = \frac{5.0}{6.7} = 0.746 \text{ hr}$$

$$\text{Nelson walks } \Delta x = (3.5)(0.746) = 2.61 \text{ miles}$$

They meet 0.61 miles N of I-30

$$\text{Sally walks } \Delta x = (3.2)(0.746) = 2.39 \text{ mi}$$

2. A rocket is launched from rest with an upward acceleration of 18 m/s^2 for 3.0 seconds, after which it is in free-fall. To what maximum height does the rocket fly?

Part 1

$$\Delta y = ?$$

$$v_0 = 0$$

$$v = ?$$

$$a = 18 \text{ m/s}^2$$

$$t = 3.0 \text{ s}$$

$$\Delta y = v_0 t + \frac{1}{2} a t^2$$

$$= 0 + 9(3)^2$$

$$= \underline{81 \text{ m}}$$

$$v = v_0 + a t$$

$$= 0 + (18)(3) = \underline{54 \text{ m/s}}$$

Part 2

$$\Delta y = ?$$

$$v_0 = 54$$

$$v = 0$$

$$a = -9.8 \text{ m/s}^2$$

$$t = ?$$

$$v^2 = v_0^2 + 2a\Delta y$$

$$0 = 54^2 + 2(-9.8)\Delta y$$

$$\Delta y = \frac{-54^2}{-19.6}$$

$$= 149 \text{ m}$$

$$\Delta y_{\text{TOT}} = 81 + 149 = \boxed{230 \text{ m}}$$