PHYS 211 College Physics I
Exam 2B

Grades

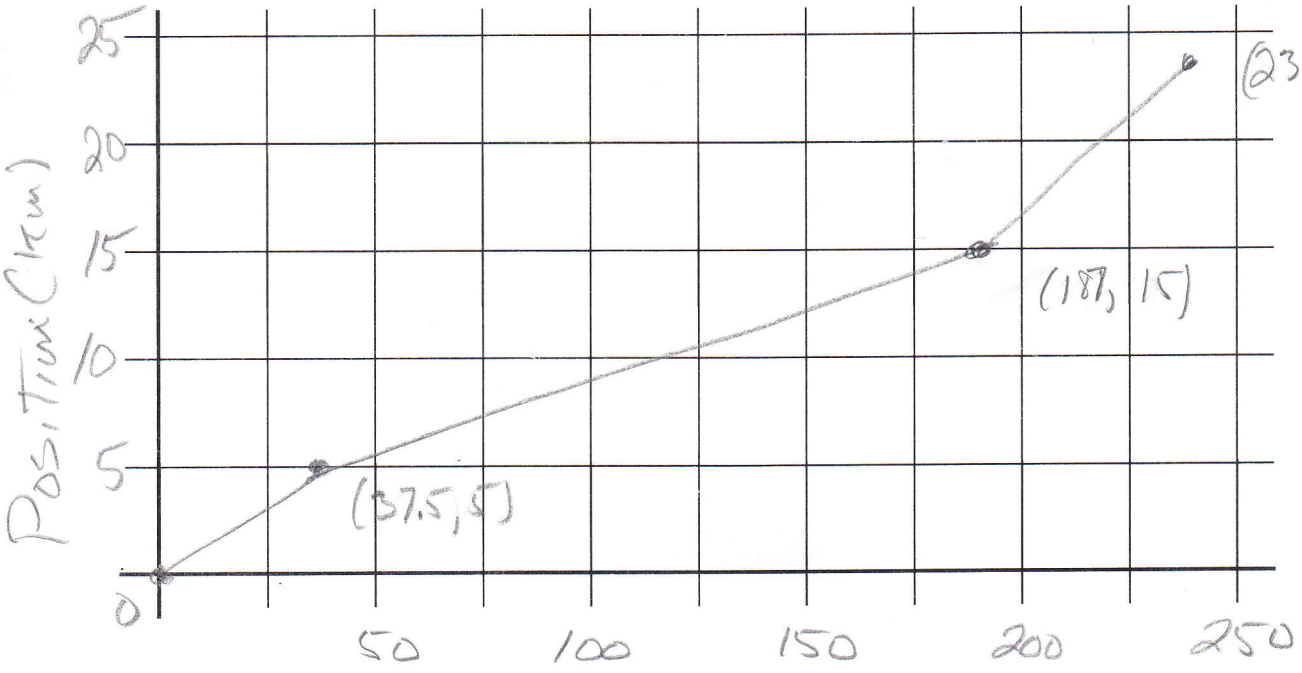
100
97
90
90
86
83
80
75,75
72,72
70
69
67
66
65
62,62,62
61,61
60
59
58
57
55
54
52
50

October 4, 2017

Name J.C. DALY

1. For the first 10.0 km of a race, a runner averages a velocity of 15.0 km/h. For the next 5.0 km he averages 8.0 km/h, and for the last 10.0 km, he averages 3.0 km/h.

   On the chart below, construct to scale, the position-time graph for the runner.



t mid (min)

$\Delta t = \frac{\Delta x}{v}$

	Δx (km)	v (km/h)	Δt (h)	Δt (min)	t (min)	x (km)
Leg 1	5	8	$\frac{5}{8}$	37.5	37.5	5
Leg 2	10	4	10/4	150	187.5	15
Leg 3	8	10	8/10	48	235.5	23

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2. A game begins with a coin toss. The referee tosses the coin with an initial vetitcal velocity of 12.00 m/s.

   a. How long is it in the air? 2.449 s

   b. How high does the coin go? 7.347 m

$$y - 0 = v_{y0}t - \frac{1}{2}gt^2$$

$$= t\left(v_{y0} - \frac{g}{2}t\right) = 0$$

$$v_{y0} - \frac{g}{2}t = 0$$

$$v_y = v_{y0} - gt$$

$$y = v_{y0}t - \frac{1}{2}gt^2$$

$$v_y^2 = v_{y0}^2 - 2gy$$

a) $$t = \frac{2v_{y0}}{g} = \frac{2\times 12}{9.8} = \frac{24}{9.8} = 2.449 \text{ s}$$

b) at y_{max} $v_y = 0$

$$v_f^2 = 0 - v_{y0}^2 - 2gy_{max}$$

$$y_{max} = \frac{v_{y1}^2}{2g} = \frac{(12)^2}{2\times 9.8} = \frac{144}{2\times 9.8} = \frac{72}{9.8}$$

$$y_{max} = 7.347 \text{ m}$$

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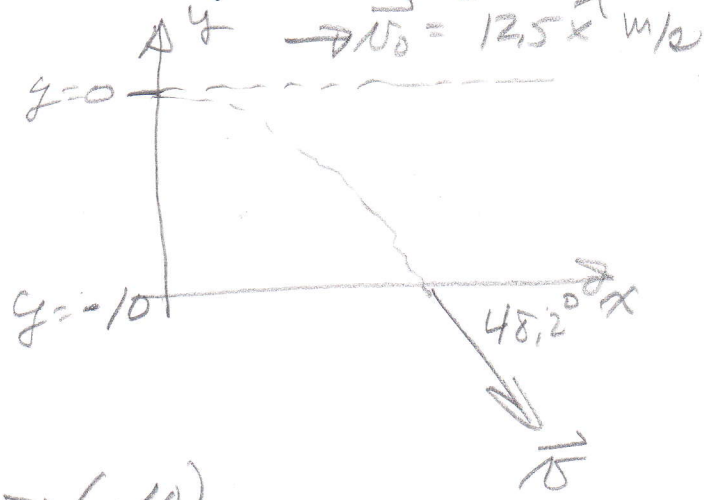
3. An eagle is flying horizontally at 12.5 m/s 10.0 meters above the ground with a fish in its claws. It accidentally drops the fish.

What is the of the magnitude and direction of the fish's velocity when it hits the ground?

a. Magnitude 18.8 m/s

b. Direction −48.2°



$\vec{v} = v_x\hat{x} + v_y\hat{y}$

$v_x = 12.5$

$v_y^2 = v_{y0}^2 - 2gy$

$= -2gy = -2 \times 9.8 \times (-10)$

$v_y = -14$ m/s

Magnitude $= v = \sqrt{(14)^2 + (12.5)^2} = 18.8$ m/s

$\theta = \tan^{-1}\left(\frac{v_y}{v_x}\right) = \tan^{-1}\left(\frac{-14}{12.5}\right) = -48.2°$

$\vec{v} = 18.8 \angle -48.2°$

$y = v_{y0}t - \frac{1}{2}gt^2$

$t = \sqrt{\frac{2H}{g}}$

$= \sqrt{\frac{20}{9.8}}$

$t = 1.43$ s

$v_y = -gt = -14$ m/s