Exam 1 Solutions

Multiple Choice Key

1. c
2. b
3. b (**There was an error on the initial key. Exam scores have been corrected to reflect the correct answer.**)
4. e
5. d
6. b
7. e
8. d
9. c
10. d

Worked Problems

1. To find the total force:
   - Find the x and y components of both vectors.

     $\mathbf{F}_1 = (55\ N)\cos 335^\circ \hat{x} + (55\ N)\sin 335^\circ = (49.8\ N)\hat{x} + (-23.2\ N)\hat{y}$

     $\mathbf{F}_2 = (71\ N)\cos 75^\circ \hat{x} + (71\ N)\sin 75^\circ = (18.4\ N)\hat{x} + (68.6\ N)\hat{y}$
   - Add the two forces together by component to find the total force.

     $\mathbf{F}_{tot} = \mathbf{F}_1 + \mathbf{F}_2 = (49.8 + 18.4\ N)\hat{x} + (-23.2 + 68.6\ N)\hat{y} = (68.2\ N)\hat{x} + (45.4\ N)\hat{y}$
   - Use the Pythagorean Theorem to determine the magnitude of the force.

     $$F_{tot} = \sqrt{(68.2\ N)^2 + (45.4\ N)^2} = 82\ N$$

2. For this problem:

   - To find the time to strike the ground, solve $y = y_0 + v_{y0}t + \frac{1}{2}a_y t^2$ for t with $y = 0\ m$, $y_0 = 25\ m$, $v_{0y} = 12\ m$, and $a_y = -9.81\ m/s^2$. This gives $t = 3.79\ s$.
   - To find the speed when the rock strikes the ground, substitute t from part (a) in $v = v_{y0} - gt$, and solve for the velocity. Since it is a 1-D problem, find the speed by taking the absolute value of the velocity, $v = 25.2\ m/s$.