

PHYS 211 Quiz #2

1. (3 points) A ball is dropped from the top of a building and is in the air 3 seconds. What is the height of the building?

$$y - y_0 = v_{0y}t - \frac{1}{2}gt^2 \rightarrow y - y_0 = 0 - (4.9m \cdot s^{-2})(3s)^2 \rightarrow y - y_0 = -44.1m$$

The height of the building is 44.1 meters

2. (5 points) What is the range of a projectile launched at a 30° angle above horizontal from the top of a 100 meter tall cliff with a speed of 10 m/s?

$$v_{0x} = (10m/s)\cos 30^\circ = 8.7m/s$$

$$v_{0y} = (10m/s)\sin 30^\circ = 5.0m/s$$

$$v_y^2 = v_{0y}^2 - 2g(y - y_0) \rightarrow v_y = \sqrt{(5.0m/s)^2 - (19.6m/s^2)(-100m)} \rightarrow v_y = 44.6m/s \rightarrow \vec{v}_y = -44.6m/s$$

$$v_y = v_{0y} - gt \rightarrow \frac{v_y - v_{0y}}{-g} = t \rightarrow \frac{-44.6m/s - 5.0m/s}{-9.8m/s^2} = 5.1s$$

$$x - x_0 = v_{0x}t + \frac{1}{2}axt^2 \rightarrow x - x_0 = (8.7m/s)(5.1s) = 44.4m$$

Could also solve using the displacement equation in y and solve the quadratic for the same result

The range is approximately 44 meters

3. (2 points) An object may be said to have a constant acceleration when:

(a) $\frac{dv}{dt} = 0$

(b) $\frac{dv}{dt} = C$

(c) $\frac{d^2x}{dt^2} = C$

(d) **All of the above**