1A.8. Review of the Models

For each of the Examples #1 through #3:

(a) State whether the correct model is linear, quadratic or exponential.
(b) Write the equation for the situation using the indicated variables.

Example #1. Mischievious Mike drops a quarter from the observation deck of the John Hancock building, which is 1000 ft above street level.

$Y \equiv$ height of quarter in feet
$t \equiv$ time in seconds

SOLUTION:

(a) quadratic

(b) $y = y_0 + v_0 t - \frac{1}{2} g t^2$, $y_0 = 1000$, $v_0 = 0$, $g = 32.2$

$y = 1000 - 16.1 t^2$

Example #2. Steve's Landscaping sells hardwood mulch for $40.00 per yd^3. The delivery charge is $70.00.

$C \equiv$ cost
$m \equiv$ cubic yards of mulch

SOLUTION:

(a) linear

(b) $C = 70 + 40m$

Example #3. In 1970, the population of India was 0.56 billion people. In 2010 it was 1.24 billion.

p = population in billions
y = years after 1970

SOLUTION:

(a) exponential ◄

(b) $p = 0.56\,(b)^y$ $\quad 2010 \rightarrow y = 40$ $\quad 1.24 = 0.56\,(b)^{40}$

$$\frac{1.24}{0.56} = b^{40}, \quad b = \sqrt[40]{\frac{1.24}{0.56}} = 1.020\,072\,035$$

$$p = 0.56\,(1.020\,072\,035)^y \blacktriangleleft$$