MAT 137 (Calculus II) Prof. Swift

Worksheet on Modeling with First Order ODEs

Suppose you drop a plush toy out of the window of a tall building. Let $v(t)$ be the speed of the toy, in feet per second, after t seconds of free fall. Assume that the frictional force is proportional to the speed, so v satisfies the ODE

$$\frac{dv}{dt} = 32 - kv,$$

where k is a positive constant. You know that the terminal speed (usually called "terminal velocity") of the toy is 160 feet per second.

1. Find the value of k.

2. What is the initial speed $v(0)$?

3. Find the velocity $v(t)$ as an explicit function of t.