Antiderivatives and Indefinite Integration II

Today we are going to solve *initial value problems*. We will be given information to solve for the constant of integration, C.

Example 1: Given that $y' = \frac{5}{x}$ and $y(e) = 3$, find $y\left(e^3\right)$.

Example 2: Given that $y'' = 2e^x + 4$, $y'(0) = 1$, and $y(3) = -1$, find $y(2)$.

Example 3: The rate of growth, $\frac{dP}{dt}$, of a population of bacteria is proportional to the square root of t with a constant coefficient of 3. If the initial population is 200, approximate the population after 10 days.

Example 4: A hot air balloon is rising vertically with a velocity of 4 ft/s. A ball is released from the hot air balloon when it is 80 ft above the ground. Use $a(t) = -32$ ft/s as acceleration due to gravity.

(a) How long will it take the ball to reach the ground?

(b) At what velocity will it hit the ground?

DIY

1. Given that $y' = 2 - 3\sin(x)$ and $y(0) = 3$, find y.