

Initial Value Problems

When solving an indefinite integral we are finding all antiderivatives of the integrand which is why we include the constant of integration. If we're given additional information we may be able to find a specific antiderivative with given properties. This is called an initial value problem.

Examples: Find $f(x)$ by solving the initial value problem.

$$1) f'(x) = e^x - 2x; f(0) = 2$$

$$2) f''(x) = \frac{6x^3 + x^2 - 1}{x^2}; f'(1) = 1, f(1) = \frac{1}{2}$$

$$3) f'(x) = \frac{3x^2}{2\sqrt{x^3-1}}; f(1) = 1$$

$$4) f'(\theta) = -\sin \theta + \sec^2 \theta; f\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$$

Example: The number of people watching TV on mobile phones is expected to grow at the rate of

$$N'(t) = \frac{5.4145}{\sqrt{1+0.91t}} \quad (0 \leq t \leq 4)$$

million/year. The number of people watching TV on mobile phones at the beginning of 2007 was 11.9 million.

(a) Find an expression giving the number of people watching TV on mobile phones in year t .

(b) According to this projection, how many people were watching TV on mobile phones at the beginning of 2011?