

1. For each problem, find two different functions that have the given derivative.

(a) $\frac{dy}{dx} = 3$

(b) $\frac{dy}{dx} = 3x^2$

(c) $\frac{dw}{dx} = 8x^3 - x^2 + 5x - 10$

(d) $\frac{dh}{dt} = \frac{4}{t}$

(e) $\frac{dy}{dx} = 30e^x + 5$

(f) $\frac{dq}{dt} = 50e^{-t}$

(g) $\frac{dP}{dt} = t^3 + \frac{1}{t^3}$

(h) $\frac{dy}{dx} = \frac{1}{x+4}$

(i) $\frac{dz}{dy} = e^{3y}$

(j) $\frac{dv}{dr} = \frac{100}{e^r}$

(k) $\frac{ds}{dt} = 4e^t + 3e^{-t}$

(l) $\frac{dP}{dt} = \frac{1}{\sqrt{t}}$

(m) $\frac{dP}{dt} = \frac{2}{t} - \frac{3}{t^2}$

(n) $\frac{dh}{ds} = 30e^{2s} + e^{3s}$

(o) $\frac{dP}{dt} = 5e^{0.05t}$

(p) $\frac{dy}{dx} = xe^{x^2}$

(q) $\frac{dy}{dx} = 8x(x^2 + 1)^3$

(r) $\frac{dy}{dx} = 12x^2\sqrt{x^3 + 7}$

(s) $\frac{dy}{dx} = -3xe^{-0.25x^2}$

2. Evaluate the following indefinite integrals

(a) $\int 3 dx$

(b) $\int 3x^2 dx$

(c) $\int (8x^3 - x^2 + 5x - 10) dx$

(d) $\int \frac{4}{t} dx$

(e) $\int (30e^x + 5) dx$

(f) $\int 50e^{-t} dt$

(g) $\int \left(t^3 + \frac{1}{t^3}\right) dt$

(h) $\int \frac{1}{x+4} dx$

(i) $\int e^{3y} dy$

(j) $\int \frac{100}{e^x} dx$

(k) $\int (4e^t + 3e^{-t}) dt$

(l) $\int \frac{1}{\sqrt{t}} dt$

(m) $\int \left(\frac{2}{t} - \frac{3}{t^2}\right) dt$

(n) $\int (30e^{2s} + e^{3s}) ds$

(o) $\int 5e^{0.05t} dt$

(p) $\int xe^{x^2} dx$

(q) $\int 8x(x^2 + 1)^3 dx$

(r) $\int 12x^2\sqrt{x^3 + 7} dx$

(s) $\int -3xe^{-0.25x^2} dx$

3. Find explicit solutions to the following initial value problems.

(a) $\frac{dq}{dr} = 3.2, \quad q(2) = 8.9$

(b) $\frac{dh}{ds} = \ln(10), \quad h(0) = 8$

(c) $\frac{dq}{dt} = -0.4q, \quad q(0) = 30$

(d) $\frac{dw}{dz} = 0.6z, \quad w(0) = 40$

(e) $\frac{dv}{dq} = v^2, \quad v(8) = \frac{1}{3}$

(f) $\frac{dP}{dt} = \sqrt{P}, \quad P(0) = 10$

(g) $\frac{dy}{dt} = 6t^2 + 5, \quad y(0) = 8$

(h) $\frac{dw}{dx} = \frac{2x - 5}{3w^2}, \quad w(0) = 2$

(i) $\frac{dy}{dt} = \frac{2t}{3y^2}, \quad y(0) = 5$

(j) $\frac{dy}{dx} = \frac{10xy}{x^2 + 1}, \quad y(0) = 4$

(k) $\frac{ds}{dr} = \frac{1}{\sqrt[3]{s^2}}, \quad s(10) = 2$

(l) $\frac{dg}{ds} = \frac{1}{s - 2}, \quad g(5) = 4$

(m) $\frac{dr}{dv} = 1/(2re^{r^2}), \quad r(-2) = 0$

$$(n) \frac{dq}{dr} = 0.4r, \quad q(0) = 300$$

$$(o) \frac{dh}{dr} = 0.1h, \quad h(0) = 400$$

$$(p) \frac{dP}{dt} = -0.2P, \quad P(0) = 500$$

$$(q) \frac{dw}{dt} = 6e^{2t}, \quad w(0) = 8$$

$$(r) \frac{dy}{dx} = e^{-y}, \quad y(0) = 0$$

$$(s) \frac{dy}{dx} = e^{-x}, \quad y(0) = 0$$

$$(t) \frac{dW}{dx} = 8x^3 + 3x^2, \quad W(1) = 8$$

$$(u) \frac{dq}{dt} = \frac{1}{t^2}, \quad q(1) = 3$$

$$(v) \frac{dq}{dt} = \frac{1}{q^2}, \quad q(1) = 3$$

$$(w) \frac{dy}{dx} = 9x^2y^2, \quad y(0) = \frac{1}{4}$$

$$(x) \frac{dy}{dx} = y + 10, \quad y(0) = 50$$

$$(y) \frac{dy}{dx} = x + 10, \quad y(0) = 50$$

$$(z) \frac{dP}{dt} = rP \left(1 - \frac{P}{k} \right), \quad P(0) = P_0$$