

# AP Calculus AB

## Initial Value Problem

$$1) \frac{dy}{dx} = 5x^4 - \sec^2 x$$

$$y = x^5 - \tan x + C$$

$$3) \frac{dy}{dx} = \frac{1}{x} - \frac{1}{x^2}$$

$$\frac{dy}{dx} = x^{-1} - x^{-2}$$

$$y = \ln|x| + \frac{1}{x} + C$$

$$5) \frac{dy}{dx} = 3 \sin x$$

$$y = -3 \cos x + C$$

$$2 = -3 \cos 0 + C$$

$$2 = -3 + C$$

$$5 = C$$

$$y = -3 \cos x + 5$$

$$2) \frac{dy}{dx} = \sin x - e^{-x} + 8x^3$$

$$y = -\cos x + e^{-x} + 2x^4 + C$$

$$4) \frac{dy}{dt} = 3t^2 \cos(t^3)$$

$$y = \sin(t^3) + C$$

$$6) \frac{dy}{dx} = 2e^x - \cos x$$

$$y = 2e^x - \sin x + C$$

$$3 = 2e^0 - \sin 0 + C$$

$$1 = C$$

$$y = 2e^x - \sin x + 1$$

$$7) f'(x) = 7x^6 - 3x^2 + 5$$

$$f(x) = x^7 - x^3 + 5x + C$$

$$1 = 1 - 1 + 5 + C$$

$$-4 = C$$

$$f(x) = x^7 - x^3 + 5x - 4$$

$$8) y' = 10x^9 + 5x^4 - 2x + 4$$

$$y = x^{10} + x^5 - x^2 + 4x + C$$

$$6 = 1 + 1 - 1 + 4 + C$$

$$1 = C$$

$$y = x^{10} + x^5 - x^2 + 4x + 1$$

$$9) f'(x) = -x^{-2} - 3x^{-4} + 12$$

$$f(x) = x^{-1} + x^{-3} + 12x + C$$

$$3 = 1 + 1 + 12 + C$$

$$-11 = C$$

$$f(x) = \frac{1}{x} + \frac{1}{x^3} + 12x - 11$$

$$10) \frac{dy}{dx} = 5 \sec^2 x - \frac{3}{2} x^{1/2}$$

$$y = 5 \tan x - x^{3/2} + C$$

$$7 = 5 \tan 0 - 0 + C$$

$$7 = C$$

$$y = 5 \tan x - x^{3/2} + 7$$

$$11) \frac{dx}{dt} = t^{-1} - t^{-2} + 6$$

$$x = \ln t + t^{-1} + 6t + C$$

$$0 = \ln 1 + 1 + 6 + C$$

$$-7 = C$$

$$x = \ln t + \frac{1}{t} + 6t - 7$$

$$13) \frac{d^2y}{dx^2} = 24x^2 - 10$$

$$\frac{dy}{dx} = 8x^3 - 10x + C$$

$$3 = 8 - 10 + C$$

$$5 = C$$

$$\frac{dy}{dx} = 8x^3 - 10x + 5$$

$$y = 2x^4 - 5x^2 + 5x + C$$

$$5 = 2 - 5 + 5 + C$$

$$3 = C$$

$$y = 2x^4 - 5x^2 + 5x + 3$$

$$12) \frac{dv}{dt} = 4 \sec t \tan t + e^t + 6t$$

$$v = 4 \sec t + e^t + 3t^2 + C$$

$$5 = 4 \sec 0 + e^0 + 0 + C$$

$$0 = C$$

$$v = 4 \sec t + e^t + 3t^2$$

$$14) f''(x) = \cos x - \sin x$$

$$f'(x) = \sin x + \cos x + C$$

$$2 = 0 + 1 + C$$

$$1 = C$$

$$f'(x) = \sin x + \cos x + 1$$

$$f(x) = -\cos x + \sin x + x + C$$

$$0 = -1 + 0 + 0 + C$$

$$1 = C$$

$$f(x) = -\cos x + \sin x + x + 1$$