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Calculus 1 Assignment-9
Section: 04
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9. Find the most general antiderivative of the function. (Check your answer by differentiation.)

$$f(x) = x(12x + 8)$$
$$f(x) = 12x^2 + 8x$$
$$F(x) = 4x^3 + 4x^2 + C$$

15. Find the most general antiderivative of the function. (Check your answer by differentiation.)

$$f(x) = \frac{2t - 4 + 3\sqrt{t}}{\sqrt{t}}$$
$$f(x) = 2\sqrt{t} - \frac{4}{\sqrt{t}} + 3$$
$$f(x) = 2t^{1/2} - 4t^{-1/2} + 3$$
$$F(x) = \frac{4}{3}t^{3/2} - 8t^{1/2} + 3t + C$$

19. Find the most general antiderivative of the function. (Check your answer by differentiation.)

$$f(\theta) = 2\sin\theta - 3\sec\theta\tan\theta$$
$$F(\theta) = -2\cos\theta - 3\sec\theta + C$$

22. Find the most general antiderivative of the function. (Check your answer by differentiation.)

$$h(x) = \sec^2 x + \pi\cos x$$
$$H(x) = \tan x + \pi\sin x + C$$

29. Find the antiderivative F of f that satisfies the given condition. Check your answer by comparing the graphs of f and F.

$$f''(x) = 4x^3 + 24x - 1$$
$$f'(x) = x^4 + 12x^2 - x + C$$
$$f(x) = \frac{x^5}{5} + 4x^3 - \frac{x^2}{2} + Cx + D$$

39. Find f.

$$f'(t) = \sec t(\sec t + \tan t),\ -\frac{\pi}{2} < t < \frac{\pi}{2},\ f(\pi/4) = -1$$

$$f'(t) = \sec^2 t + \sec t \tan t$$

$$f(t) = \tan t + \sec t + C$$

Because $f(\pi/4) = -1$:

$$\tan \pi/4 + \sec \pi/4 + C = -1$$

$$1 + \sqrt{2} + C = -1$$

$$C = -2 - \sqrt{2}$$

Hence

$$f(t) = \tan t + \sec t - 2 - \sqrt{2}$$

61. A particle is moving with the given data. Find the position of the particle.

$$a(t) = 2t + 1,\ s(0) = 3,\ v(0) = -2$$

$$v(t) = t^2 + t + C$$

Because $v(0) = -2$:

$$(0)^2 + 0 + C = -2$$

$$C = -2$$

Hence:

$$v(t) = t^2 + t - 2$$

$$s(t) = \frac{t^3}{3} + \frac{t^2}{2} - 2t + D$$

Because $s(0) = 3$

$$\frac{(0)^3}{3} + \frac{(0)^2}{2} - 2(0) + D = 3$$

$$D = 3$$

Hence:

$$s(t) = \frac{t^3}{3} + \frac{t^2}{2} - 2t + 3$$

65. A stone is dropped from the upper observation deck (the Space Deck) of the CN Tower, $450m$ above the ground.

(a) Find the distance of the stone above ground level at time t.
Let assume $g = 9.8m/s^2$:

$$s(t) = 450 - \frac{9.8}{2}t^2$$

$$s(t) = 450 - 4.9t^2$$

(b) How long does it take the stone to reach the ground?
The time it takes the stone to reach the ground is:

$$s(t) = 450 - 4.9t^2 = 0$$

$$4.9t^2 = 450$$
$$t^2 = 91\frac{41}{49}$$
$$t = \pm\sqrt{91\frac{41}{49}}$$

Because the time t cannot be negative:

$$t = \sqrt{91\frac{41}{49}}$$

(c) With what velocity does it strike the ground?

$$v(t) = -9.8t$$

The stone strikes the ground at $t = \sqrt{91\frac{41}{49}}$:

$$v(\sqrt{91\frac{41}{49}}) = -9.8(\sqrt{91\frac{41}{49}})$$

(d) If the stone is thrown downward with a speed of $5m/s$, how long does it take to reach the ground?