

WARMUP

Acceleration due to gravity on the distant planet Chaubunagungamaug is -200 ft/sec^2 . A rock is thrown upward from a height of 200 ft with an initial velocity of 100 ft/sec .

a) Find $a(t)$, $v(t)$, $h(t)$.

b) How high does the rock go?

c) With what velocity does the rock hit the ground?

a) $a(t) = -200$

$$v(t) = -200t + C \underset{\substack{\uparrow \\ 100}}{=} -200t + 100$$

$$h(t) = -100t^2 + 100t + 200 \underset{\substack{\uparrow \\ \text{initial height}}}{}$$

b) $v(t) = 0$

$$-200t + 100 = 0$$

$$-200t = -100$$

$$t = 0.5$$

$$h(0.5) = -100(0.5)^2 + 100(0.5) + 200 \\ = 225 \text{ ft}$$

c) $h(t) = -100t^2 + 100t + 200 = 0$

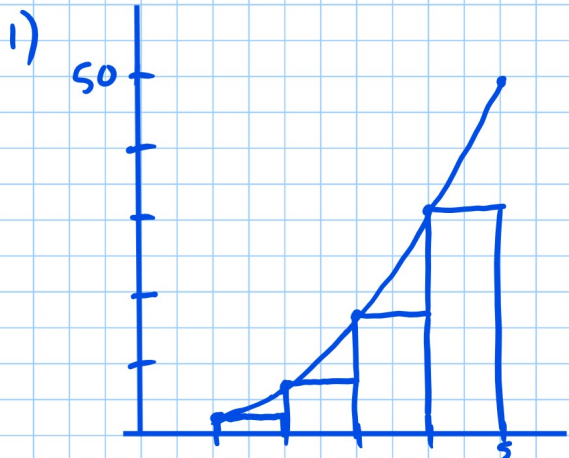
$$-100(t^2 - t - 2) = 0$$

$$-100(t-2)(t+1) = 0$$

$$t = 2 \text{ sec } t = \cancel{-1 \text{ sec}}$$

$$v(2) = -200 \cdot 2 + 100 \\ = -300 \text{ ft/sec}$$

Practice Test Solutions



x	y
1	1
2	7
3	17
4	31
5	49

$$\text{Area} = 1 \cdot 1 + 1 \cdot 7 + 1 \cdot 17 + 1 \cdot 31$$

$$= 56$$

underestimate

$$2) a) a(t) = -14$$

$$v(0) = 28$$

$$h(0) = 35$$

$$v(t) = -14t + 28$$

↳ initial velocity

$$h(t) = \frac{-14t^2}{2} + 28t + 35 = -7t^2 + 28t + 35$$

↳ initial height

$$b) \text{ Set } v(t) = 0$$

Plug into $h(t)$

$$-14t + 28 = 0$$

$$-14t = -28$$

$$t = 2 \text{ seconds}$$

$$h(2) = -7(2)^2 + 28(2) + 35$$
$$= 63 \text{ ft}$$

$$c) \text{ Set } h(t) = 0$$

Plug into $v(t)$

$$-7t^2 + 28t + 35 = 0$$

$$-7(t^2 - 4t - 5) = 0$$

$$(t-5)(t+1) = 0$$

$$t = 5 \text{ or } t = -1$$

$$v(5) = -14 \cdot 5 + 28$$

$$= -42 \text{ ft/sec}$$

$$3) a) \int (x^3 - 8x^2 + 7) dx$$

$$\frac{x^4}{4} - \frac{8x^3}{3} + 7x + C$$

$$\text{OR } \frac{1}{4}x^4 - \frac{8}{3}x^3 + 7x + C$$

$$b) \int 6x^{7/2} dx$$

$$\frac{6x^{9/2}}{9/2} + C$$

$$\frac{2}{9} \cdot 6x^{9/2} + C$$

$$\frac{4}{3}x^{9/2} + C$$

$$\text{OR } \frac{4}{3}\sqrt{x^9} + C$$

$$c) \int_0^2 (x^2+2)(5-x^3) dx$$

$$\int_0^2 (5x^2 - x^5 + 10 - 2x^3) dx$$

$$\left(\frac{5x^3}{3} - \frac{x^6}{6} + 10x - \frac{x^4}{2} \right)_0^2$$

$$\left(\frac{5 \cdot 2^3}{3} - \frac{2^6}{6} + 10 \cdot 2 - \frac{2^4}{2} \right) - 0 \quad \leftarrow \text{key step}$$

calculator

$$= \frac{44}{3}$$

$$d) \int \frac{6-3x+x^2}{2x} dx = \int \left(\frac{6}{2x} - \frac{3x}{2x} + \frac{x^2}{2x} \right) dx$$

$$= \int \left(\frac{3}{x} - \frac{3}{2} + \frac{1}{2}x \right) dx$$

$$= 3 \ln|x| - \frac{3}{2}x + \frac{1}{2} \cdot \frac{x^2}{2} + C$$

$$= 3 \ln|x| - \frac{3}{2}x + \frac{x^2}{4} + C$$

$$\frac{3}{x} = 3 \cdot \frac{1}{x}$$

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

$$e) \int (5 \sin x - \frac{7}{x} + 4e^x) dx$$

$$\int c f(x) dx = c \int f(x) dx$$

$$5(-\cos x) - 7 \ln|x| + 4e^x + C$$

$$-5 \cos x - 7 \ln|x| + 4e^x + C$$

$$\begin{aligned}
 f) \int_1^5 (5-x) dx &= \left(5x - \frac{x^2}{2} \right) \Big|_1^5 \\
 &= \left(5 \cdot 5 - \frac{5^2}{2} \right) - \left(5 \cdot 1 - \frac{1^2}{2} \right) \quad \leftarrow \text{key step} \\
 &= 12.5 - 4.5 \\
 &= 8
 \end{aligned}$$

$$4a) f'(x) = 7 - 2x^2 \quad \underbrace{f(-1) = 7}$$

$$f(x) = 7x - \frac{2x^3}{3} + C$$

$$f(-1) = 7(-1) - \frac{2(-1)^3}{3} + C = 7$$

$$-7 + \frac{2}{3} + C = 7$$

$$-\frac{19}{3} + C = 7$$

$$C = \frac{40}{3}$$

$$f(x) = 7x - \frac{2x^3}{3} + \frac{40}{3}$$

$$b) f'(x) = 3\cos x \quad f\left(\frac{\pi}{2}\right) = 2$$

$$f(x) = 3\sin x + C$$

$$3\sin\frac{\pi}{2} + C = 2$$

$$3 \cdot 1 + C = 2$$

$$C = -1$$

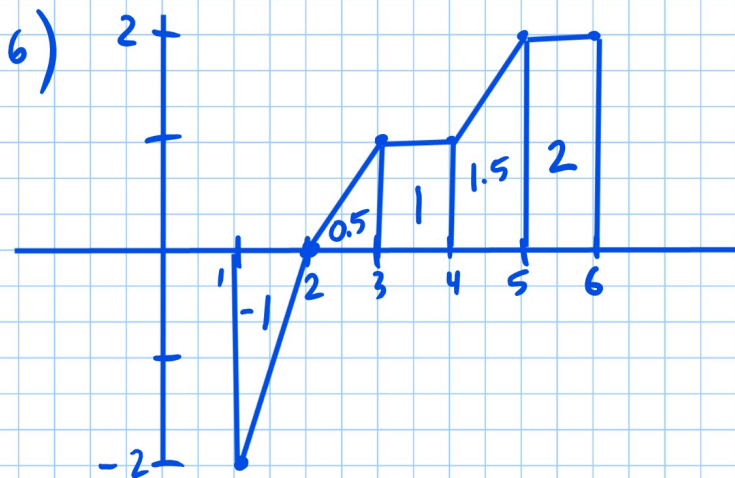
$$f(x) = 3\sin x - 1$$

$$5) \text{ Avg value} = \frac{1}{b-a} \int_a^b f(x) dx$$

$$\frac{1}{3-(-1)} \underbrace{\int_{-1}^3 (5x^2-6) dx}_{\substack{\text{fnInt} \\ \text{on} \\ \text{calculator}}} = \frac{1}{4} \cdot \frac{68}{3} = \frac{17}{3}$$

MATH 9

fnInt(5X²-6, X, -1, 3) ► FRAC enter



$$a) \int_1^3 f(x) dx = -0.5$$

$$b) \int_3^5 f(x) dx = 2.5$$

$$c) \int_1^6 f(x) dx = 4$$

$$d) \frac{1}{6-1} \underbrace{\int_1^6 f(x) dx}_4 = \frac{1}{5} \cdot 4 = \frac{4}{5}$$