Integral As Accumulator Solutions

Thursday, January 28, 2016
2:30 PM

1) $\int_0^b f(t)\,dt = F(b) - F(0) \Rightarrow F(b) = \int_0^b f(t)\,dt + F(0)$

$b = 2 \qquad F(2) = \int_0^2 f(t)\,dt + 11 = 1\frac{1}{2} + 11 = 12\frac{1}{2}$

$b = 3 \qquad F(3) = \int_0^3 f(t)\,dt + 11 = 1 + 11 = 12$

$b = 6 \qquad F(6) = \int_0^6 f(t)\,dt + 11 = -1\frac{1}{2} + 11 = 9\frac{1}{2}$

2) a) $\int_{-3}^{0} f(x)\,dx = -2$

b) $\int_{-3}^{4} f(x)\,dx = \frac{-A}{2}$

3) $F(0) = 10$, $F'(\theta) = f(\theta) = \sin^2(\theta) \qquad 0 \le \theta \le 2.5$

$\int_0^b f(\theta)\,d\theta = F(b) - F(0)$

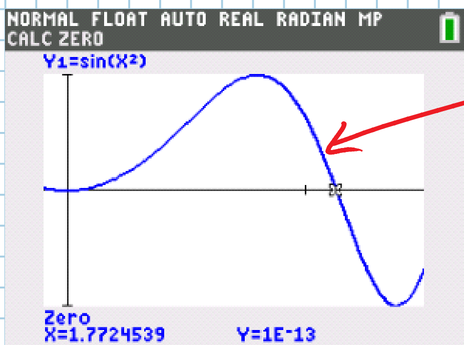
$F(b) = \int_0^b \sin(\theta^2)\,d\theta + F(0)$

$b = .5 \qquad F(.5) = \int_0^{.5} \sin(\theta^2)\,d\theta + 10 = 10.041$

$b = 1.5 \qquad F(1.5) = \int_0^{1.5} \sin(\theta^2)\,d\theta + 10 = 10.778$

$b = 2.5 \qquad F(2.5) = \int_0^{2.5} \sin(\theta^2)\,d\theta + 10 = 10.431$

4)



$F'(\theta) = f(\theta) = \sin(\theta^2)$

$\int_0^{\theta} f(x)\,dx = F(\theta) - F(0)$

$F(\theta) = \int_0^{\theta} f(x)\,dx + F(0)$

$F(\theta) = \int_0^{\theta} f(x)\,dx + 10$

INC. ON $[0, 1.772]$

Dec. ON $[1.772, 2.5]$

5) yes, @ $x = 1.772 \qquad F(1.772) \approx 10.895$

6) $F(t) = t(\ln t) - t \Rightarrow f(t) = F'(t) = \ln t$ find $\int_{10}^{12} \ln t\,dt$

a) LRAM: $\frac{1}{5}\left[f(10) + f(10.2) + f(10.4) + \ldots + f(11.8)\right] \approx 4.775$

RRAM: $\frac{1}{5}\left[f(10.2) + f(10.4) + f(10.6) + \ldots + f(12)\right] \approx 4.811$

b) $\int_{10}^{12} \ln t\,dt = t(\ln t) - t \Big|_{10}^{12} = (12 \cdot \ln 12 - 12) - (10 \ln 10 - 10) \approx 4.793$

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c) $\int_{10}^{12} \ln t\,dt \approx 4.793$

d) SAME

7) a) $r(1) = 40(1.002)^1 = \$40.08/\text{month}$

b) The rate of salary change of an avg. American on JAN 1, 1994 is \$40.97/month

c) $\int_0^{12} r(t)\,dt = \int_0^{12} 40(1.002)^t\,dt = \$485.80$

d) $\int_5^{12} 40(1.002)^t\,dt = \$284.798$ OR \$284.80

This is the amount that the avg. American's salary went up by from May 1, 1993 to Dec 1, 1993.

8) $f(x) = \int_0^x f'(t)\,dt$ $\qquad f(3) > f(4)$ because

$$\int_0^3 f'(t)\,dt > \int_0^4 f'(t)\,dt$$

9) $f(b) - f(a) = \int_a^b f'(t)\,dt$

$$f(3) - f(2) < \frac{f(4) - f(2)}{2} < f(4) - f(3)$$

10) $\int_0^t r(t)\,dt = R(t) - R(0)$ where $R(t) =$ temp @ time t

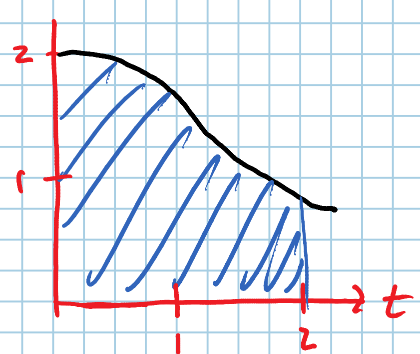
$$\int_0^{10} -7e^{-0.1t}\,dt = R(10) - 90°C$$

$$R(10) = \int_0^{10} -7e^{-0.1t}\,dt + 90°C = -44.248 + 90 = 45.752°C$$

$$= 45.8°C$$

11) a) $\int_0^2 R(t)\,dt$

b)



c) UPPER Estimate uses LRAM

$.25(1.95 + 1.9 + 1.75 + \ldots + 1.125)$

Lower Estimate uses RRAM

$.25(1.9 + 1.75 + \ldots + 1.0)$

d) ANSWERS VARY