MA-131

Lab Practice Solt'ns

Complete questions are in textbook.

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#13) $\int \left(\frac{2}{x} + \frac{x}{2}\right) dx \quad = 2\ln(|x|) + \frac{1}{2}\left(\frac{x^2}{2}\right) + C$

#17) $\int \left(x - 2x^2 + \frac{1}{3x}\right) dx \quad = \frac{x^2}{2} - 2\left(\frac{x^3}{3}\right) + \frac{1}{3}\ln(|x|) + C$

#18) $\int \left(\frac{7}{8}\frac{1}{x^3} - \sqrt[3]{x}\right) dx \quad = \frac{7}{2}\left(\frac{x^{-2}}{-2}\right) - \frac{x^{4/3}}{4/3} + C = \frac{-7}{4x^2} - \frac{3}{4}x^{4/3} + C$

#20) $\int e^{-x}\, dx \quad = \frac{1}{-1}e^{-x} + C = -e^{-x} + C$

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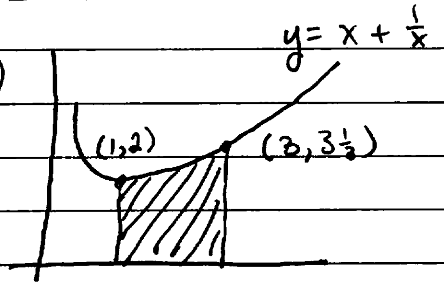
#2)



Definite integral: $\int_1^3 (x + \frac{1}{x})\, dx$

Area of shaded region: $\left.\frac{x^2}{2} + \ln(|x|)\right|_1^3 =$

$$= \left(\frac{9}{2} + \ln(|3|)\right) - \left(\frac{1^2}{2} + \underbrace{\ln(|1|)}_{=0}\right) = 4 + \ln(3)$$

#12) $\int_0^1 (4x^3 - 1)\, dx \quad = \left. x^4 - x \right|_0^1 = (1^4 - 1) - (0^4 - 0) = 0$

#17) $\int_0^{\ln(3)} e^{-2t}\, dt \quad = \left.\frac{e^{-2t}}{-2}\right|_0^{\ln(3)} = \frac{-1}{2}\left(e^{-2\ln(3)} - e^{-2(0)}\right)$

$$= \frac{-1}{2}\left(\left(e^{\ln(3)}\right)^{-2} - 1\right) = \frac{-(3)^{-2}}{2} + \frac{1}{2}$$

$$= 4/9$$

#32) Find the area under the curve: $y = \sqrt{x}$; $x = 0$ to $x = 4$

$$= \int_0^4 (\sqrt{x})\,dx = \frac{2}{3}x^{3/2}\Big|_0^4 = \frac{2}{3}(8)$$

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#37 (Cigarette Consumption)

rate: $c(t) = 0.1t + 2.4$

$t = 0$ in 1960

\# cigarettes sold from 1960 to 1998

$$= \int_0^{38} (0.1t + 2.4)\,dt = 0.1\frac{t^2}{2} + 2.4t\Big|_0^{38}$$

$$= \left(0.1\,\frac{38^2}{2} + 2.4(38)\right) - 0$$

$$= 163.4 \text{ trillion cigarettes}$$

\# cig's sold from 1980 to 1998?

$$= \int_{20}^{38} (0.1t + 2.4)\,dt = 0.1\frac{t^2}{2} + 2.4t\Big|_{20}^{38}$$

$$= (163.4) - (20 + 48)$$

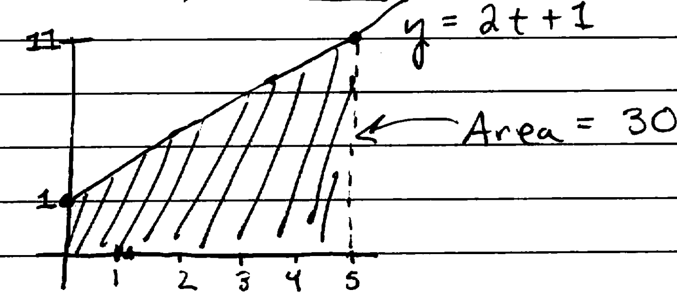
$$= 95.4 \text{ trillion cigaretts.}$$

#39) Helicopter rising w/ velocity: $v(t) = 2t + 1$ ft/sec

(a) $\int_0^5 (2t + 1)\,dt = t^2 + t\Big|_0^5 = 30$

$\Rightarrow \boxed{30 \text{ ft}}$

(b)



#45) (Heat Diffusion)

Temp of food dropping at rate of

$r(t) = 12 + \frac{4}{(t+3)^2}$ °F/hr

(a) Area under curve: $0 \le t \le 2$

$$\int_0^2 \left(12 + \frac{4}{(t+3)^2}\right)dt = 12t + \frac{-4}{(t+3)}\Bigg|_0^2$$

$$= \left(24 - \frac{4}{5}\right) - \left(0 - \frac{4}{3}\right) = 24 + \frac{8}{15} = \frac{368}{15}$$

(b) The total # of degrees that the food temperature dropped in the first 2 hours was

$\frac{368}{15}$ °F