Homework 1 Solutions MAT 17B

Section 5.8 pg 272

3. $x^2 + 3x - 4$

$= x^2 + 3x - 4x^0$

Use Rules 1, 2 + 3 from Table 5-1 to get

$$\boxed{\frac{x^3}{3} + \frac{3x^2}{2} - 4x + C}$$

11. $1 - \frac{1}{x^2} = x^0 - \frac{1}{x^2} = x^0 - x^{-2}$

Use Rules 2 + 3 from Table 5-1:

$$x - \left(\frac{1}{-1}\right)x^{-1} = \boxed{x + \frac{1}{x} + C}$$

19. e^{-3x}

Use Rule 5 from Table 5-1:

$$\boxed{\frac{1}{-3}e^{-3x} + C}$$

20. $e^{x/2} + e^{-x/2}$

Use Rules 2 + 5 from Table 5-1

$$\frac{1}{\left(\frac{1}{2}\right)}e^{x/2} + \frac{1}{\left(-\frac{1}{2}\right)}e^{-x/2} + C = \boxed{2e^{x/2} - 2e^{-x/2} + C}$$

$$\sin\left(\frac{x}{3}\right) + \cos\left(\frac{x}{3}\right)$$

27. Use Rules 2, 6, 7

$$-\frac{1}{\left(\frac{1}{3}\right)}\cos\left(\frac{x}{3}\right) + \frac{1}{\left(\frac{1}{3}\right)}\sin\left(\frac{x}{3}\right)$$

$$= \boxed{-3\cos\frac{x}{3} + 3\sin\frac{x}{3} + C}$$

29. Use Rules 1, 2, 6, 7 from Table 5-1.

39. $\sec^2(3x-1) + \dfrac{x^2-3}{x}$

$$= \sec^2(3x-1) + \frac{x^2}{x} - \frac{3}{x} = \sec^2(3x-1) + x - \frac{3}{x}$$

Use Rule 8 to guess antiderivative of $\sec^2(3x-1)$ is $\frac{1}{3}\tan(3x-1)$ [Check by differentiating $\frac{1}{3}\tan(3x-1)$]

Use Rule 3 to get antiderivative of x to be $\frac{x^2}{2}$

Use Rule 1, 4 to get antiderivative of $-\frac{3}{x}$ to be $-3\ln|x|$

Use Rule 2 to put it all together: $\boxed{\frac{1}{3}\tan(3x-1) + \frac{x^2}{2} - 3\ln|x| + C}$

69. $\frac{dT}{dt} = \sin(\pi t)$

$T(t)$ is antiderivative of $\sin(\pi t)$

which is $-\frac{1}{\pi}\cos(\pi t)$ using Table 5-1.

So the general antiderivative is

$$T(t) = -\frac{1}{\pi}\cos(\pi t) + C$$

Now, $T(0) = 3$.

$$\Rightarrow 3 = T(0) = -\frac{1}{\pi}\cos(\pi \cdot 0) + C$$

$$= -\frac{1}{\pi} + C$$

$$\Rightarrow C = 3 + \frac{1}{\pi}$$

$$\therefore T(t) = -\frac{1}{\pi}\cos(\pi t) + \frac{1}{\pi} + 3$$

$$= \frac{1}{\pi}\left(1 - \cos(\pi t)\right) + 3$$

76. $\frac{dN}{dt} = 3\sin(2\pi t)$

$N(t)$ is antiderivative of $3\sin(2\pi t)$

which is $-\frac{3}{2\pi}\cos(2\pi t)$ using Table 5-1.

So general antiderivative $N(t) = -\frac{3}{2\pi}\cos(2\pi t) + C$

We know $N(0) = 10$.

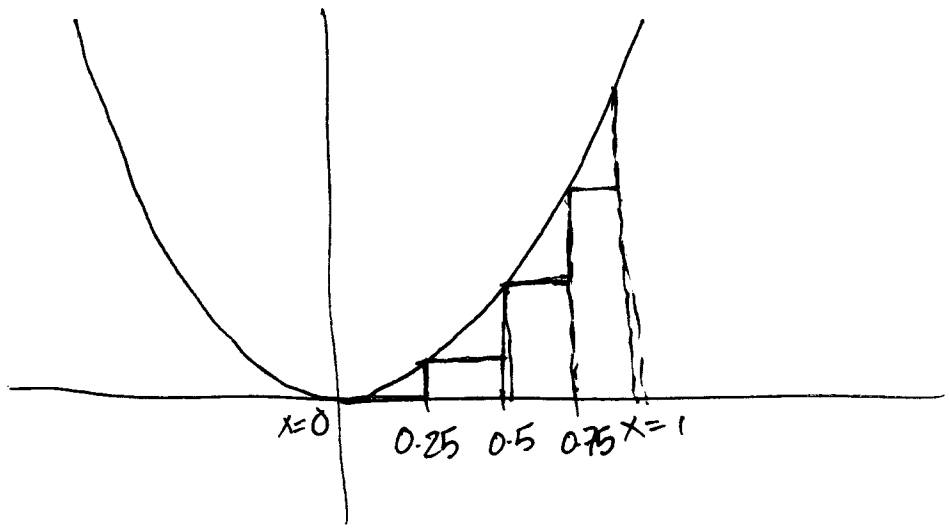
$$\therefore N(0) = 10 = -\frac{3}{2\pi}\cos(2\pi \cdot 0) + C$$

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

$$\Rightarrow \quad C = 10 + \frac{3}{2\pi}$$

$$\therefore N(t) = \boxed{-\frac{3}{2\pi}\cos(2\pi t) + \frac{3}{2\pi} + 10.}$$

Section 6.1



1. Divide into 4 subintervals $[0, 0.25, 0.5, 0.75, 1]$

2. Using left-endpts, heights of the rectangles are $0^2, (0.25)^2, (0.5)^2$ & $(0.75)^2$.

3. Adding all the areas:

$$0^2 \times 0.25 + (0.25)^2 \times 0.25 + (0.5)^2 \times 0.25 + (0.75)^2 \times 0.25$$

$$= \boxed{0.21875}$$