math 11b – HW1 solutions

Math 11B HW#1 solutions to graded problems

6. $F(x) = 2(\frac{1}{3}x^3) + \frac{1}{2}x^2 - 5x + C$

10. First, rewrite the problem, then find the antiderivative:

$$f(x) = x^2 - 2(\tfrac{1}{x})$$
$$F(x) = \tfrac{1}{3}x^3 - 2\ln|x| + C$$

14.

$$f(x) = \frac{x+1-1}{x+1} = 1 - \frac{1}{x+1}$$
$$F(x) = x - \ln|x+1| + C$$

20. $F(x) = 2e^{\frac{x}{2}} - 2e^{\frac{-x}{2}} + C$

42. $y = \frac{1}{3}t^3 - \frac{1}{5}t^5 + C$

48. $y = x + 4\tan(\frac{x}{4}) + C$

54.

$$\frac{dN}{dt} = 1 - \frac{1}{t+1}, t \geq 0$$
$$N(t) = t - \ln(t+1) + C, t \geq 0$$
$$5 = N(0) = -\ln(1) + C = C$$
$$N(t) = t - \ln(t+1) + 5, t \geq 0$$

60.

$$T(t) = \tfrac{1}{\pi}\sin(\pi t) + C$$
$$3 = T(0) = \tfrac{1}{\pi}\sin(0) + C = C$$
$$T(t) = \tfrac{1}{\pi}\sin(\pi t) + 3$$

Math 11B

HW #1 Solutions P.330 #2-20e, 38-48e, 50-60e, 66

(2) $f(x) = 1 - 3x^2 \Rightarrow F(x) = x - x^3 + C$ ($F(x)$ = antiderivative)

(4) $f(x) = 2x - 4x^3 \Rightarrow F(x) = x^2 - x^4 + C$

(6) $f(x) = 2x^2 + x - 5 \Rightarrow F(x) = 2\left(\frac{1}{3}x^3\right) + \frac{1}{2}x^2 - 5x + C$

(8) $f(x) = x - 2x^2 - 3x^3 - 4x^4 \Rightarrow F(x) = \frac{1}{2}x^2 - \frac{2}{3}x^3 - \frac{3}{4}x^4 - \frac{4}{5}x^5 + C$

(10) $f(x) = x^2 - \frac{2}{x} = x^2 - 2\left(\frac{1}{x}\right) \Rightarrow F(x) = \frac{1}{3}x^3 - 2\ln|x| + C$

(12) $f(x) = x^3 - \frac{1}{x^3} = x^3 - x^{-3} \Rightarrow F(x) = \frac{1}{4}x^4 + \frac{1}{2}x^{-2} + C$

(14) $f(x) = \frac{x}{1+x} = \frac{x+1-1}{x+1} = 1 - \frac{1}{x+1} \Rightarrow F(x) = x - \ln|x+1| + C$

(16) $F(x) = x^7 + \frac{1}{x^7} = x^7 + x^{-7} \Rightarrow F(x) = \frac{1}{8}x^8 - \frac{1}{6}x^{-6} + C$

(18) $f(x) = \frac{1}{3+x} \Rightarrow \ln|3+x| + C$

(20) $f(x) = e^{x/2} + e^{-x/2} = e^{\frac{1}{2}x} + e^{-\frac{1}{2}x} \Rightarrow F(x) = 2e^{x/2} - 2e^{-x/2} + C$

(38) $\frac{dy}{dx} = \frac{2}{x^2} - x^2 = 2x^{-2} - x^2 \Rightarrow F(x) =$

(40) $\frac{dy}{dx} = e^{-2x}, \; x > 0 \Rightarrow y = -\frac{1}{2}e^{-2x} + C, \; x > 0$

(42) $\frac{dy}{dt} = t^2(1 - t^2)$

(44) $\frac{dy}{dx} = 1 - e^{3x}$

(46) $\frac{dy}{ds} = \cos(2\pi s), \; 0 \le s \le 1$

(48) $\frac{dy}{dx} = 1 + \sec^2\left(\frac{x}{4}\right), \; -1 < x < 1$

(50) $\frac{dy}{dx} = \frac{x^2}{3}$, $x \geq 0$, w/ (0,2)

$y = \frac{x^3}{9} + C \Rightarrow 2 = 0 + C \Rightarrow C = 2$

$y = \frac{x^3}{9} + 2$, $x \geq 0$

(52) $\frac{dy}{dx} = \frac{1}{2\sqrt{x}}$, for $x \geq 1$ w/ (4,3)

$\frac{dy}{dx} = \frac{1}{2}x^{-\frac{1}{2}} \Rightarrow y = x^{\frac{1}{2}} + C \Rightarrow 3 = 4^{\frac{1}{2}} + C \Rightarrow C = 1$

$y = x^{\frac{1}{2}} + 1$, $x \geq 1$

(54) $\frac{dN}{dt} = \frac{t}{t+1}$, $t \geq 0$ w/ $N(0) = 5$

$\frac{dN}{dt} = 1 - \frac{1}{t+1} \Rightarrow N(t) = t - \ln(t+1) + C \Rightarrow 5 = -\ln|1| + C \Rightarrow 5 = C$

$N(t) = t - \ln(t+1) + 5$, $t \geq 0$

(56) $\frac{dw}{dt} = e^{2t}$, $t \geq 0$ w/ $w(0) = 5$

$w(t) = \frac{1}{2}e^{2t} + C \Rightarrow 5 = w(0) = \frac{1}{2}e^0 + C \Rightarrow C = \frac{9}{2}$

$w(t) = \frac{1}{2}e^{2t} + \frac{9}{2}$

(58) $\frac{dw}{dt} = e^{-4t}$, $t \geq 0$ w/ $w(0) = 3$

$w(t) = -\frac{1}{4}e^{-4t} + C \Rightarrow 3 = w(0) = -\frac{1}{4}e^0 + C \Rightarrow C = \frac{13}{4}$

$w(t) = -\frac{1}{4}e^{-4t} + \frac{13}{4}$

(60) $\frac{dT}{dt} = \cos(\pi t)$, $t \geq 0$ w/ $T(0) = 3$

$T(t) = \frac{1}{\pi}\sin(\pi t) \Rightarrow 3 = T(0) = \frac{1}{\pi}\sin(0) + C = 0 + C = C$

$T(t) = \frac{1}{\pi}\sin(\pi t) + 3$

(66) $\frac{dN}{dt} = 3\sin(2\pi t)$, $N(0) = 10$

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

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