

Worksheet #6 solutions

$$1) a) F(x) = \frac{x^{11}}{11} - 5\left(\frac{x^6}{6}\right) + 3x + C$$

$$b) F(x) = \frac{x^{-2}}{-2} + \frac{x^{8/3}}{8/3} + e^x + C$$

$$c) F(x) = \ln|x| + 4\left(\frac{x^{-5}}{-5}\right) - \frac{\sin(4x)}{4} + C$$

$$d) u = x^2 + 2x, \frac{du}{dx} = 2(x+1) \Rightarrow F(x) = \frac{1}{2} e^{x^2+2x} + C$$

$$e) F(x) = x^4 \sin(x) + C \quad (\text{Do product rule})$$

$$2) a) F(x) = \frac{x^3}{3} + 3\frac{x^2}{2} + C \Rightarrow 5 = F(0) = C \Rightarrow F(x) = \frac{x^3}{3} + \frac{3}{2}x^2 + 5$$

$$b) F(x) = \frac{x^{4/3}}{4/3} + C \Rightarrow 90 = F(27) = \frac{27^{4/3}}{4/3} + C = \frac{81}{4} \cdot 3 + C \Rightarrow C = 29.25$$

$$\Rightarrow F(x) = \frac{3}{4} x^{4/3} + 29.25$$

$$c) \int x \sin(\pi x) dx \quad \text{integration by parts}$$

$$u = x \quad \left| \quad du = dx\right.$$

$$dv = \sin(\pi x) dx \quad \left| \quad v = -\frac{\cos(\pi x)}{\pi} dx\right.$$

$$F(x) = -\frac{x \cos(\pi x)}{\pi} - \int -\frac{\cos(\pi x)}{\pi} dx = -\frac{x \cos(\pi x)}{\pi} + \frac{\sin(\pi x)}{\pi^2} + C$$

$$3 = F\left(\frac{1}{2}\right) = -\frac{\left(\frac{1}{2}\right) \cos\left(\frac{\pi}{2}\right)}{\pi} + \frac{\sin\left(\frac{\pi}{2}\right)}{\pi^2} + C = 0 + \frac{1}{\pi^2} + C$$

$$\Rightarrow C = 3 - \frac{1}{\pi^2}$$

$$\Rightarrow F(x) = -\frac{x \cos(\pi x)}{\pi} + \frac{\sin(\pi x)}{\pi^2} + 3 - \frac{1}{\pi^2}$$