

SOLUTION FOR HOMEWORK #1

1. SECTION 5.5

8. Let $u = x^3 + 5$. Then $du = 3x^2 dx$, so

$$\int x^2(x^3 + 5)^9 dx = \int u^9 \left(\frac{1}{3} du\right) = \frac{1}{3} \cdot \frac{1}{10} u^{10} + C = \frac{1}{30} (x^3 + 5)^{10} + C,$$

where C is a constant.

28. Let $u = \cos t$. Then $du = -\sin t dt$, so

$$\int e^{\cos t} \sin t dt = \int e^u (-du) = -e^u + C = -e^{\cos t} + C,$$

where C is a constant.

32. Let $u = e^x + 1$. Then $du = e^x dx$, so

$$\int \frac{e^x}{e^x + 1} dx = \int \frac{1}{u} du = \ln |u| + C = \ln(e^x + 1) + C,$$

where C is a constant.

2. SECTION 6.1

2.

$$\begin{aligned} A &= \int_0^2 \left(\sqrt{x+2} - \frac{1}{x+1} \right) dx = \left(\frac{2}{3} (x+2)^{3/2} - \ln(x+1) \right) \Big|_0^2 \\ &= \left(\frac{2}{3} (4)^{3/2} - \ln 3 \right) - \left(\frac{2}{3} (2)^{3/2} - \ln 1 \right) = \frac{16}{3} - \ln 3 - \frac{4}{3} \sqrt{2}. \end{aligned}$$

4.

$$\begin{aligned} A &= \int_0^3 ((2y - y^2) - (y^2 - 4y)) dy = \int_0^3 (-2y^2 + 6y) dy \\ &= \left(-\frac{2}{3} y^3 + 3y^2 \right) \Big|_0^3 = (-18 + 27) - 0 = 9. \end{aligned}$$

2

SOLUTION FOR HOMEWORK #1

6.

$$\begin{aligned} A &= \int_0^{\pi/2} (e^x - \sin x) dx = (e^x + \cos x)_0^{\pi/2} \\ &= (e^{\pi/2} + 0) - (1 + 1) = e^{\pi/2} - 2. \end{aligned}$$

10.

$$1 + \sqrt{x} = \frac{3+x}{3} \Leftrightarrow \sqrt{x} = \frac{x}{3} \Leftrightarrow x = \frac{x^2}{9} \Leftrightarrow x = 0 \text{ or } 9.$$

So

$$\begin{aligned} A &= \int_0^9 \left((1 + \sqrt{x}) - \left(\frac{3+x}{3} \right) \right) dx = \int_0^9 \left(\sqrt{x} - \frac{1}{3}x \right) dx \\ &= \left(\frac{2}{3}x^{3/2} - \frac{1}{6}x^2 \right) \Big|_0^9 = 18 - \frac{27}{2} = \frac{9}{2}. \end{aligned}$$