SOLUTION FOR HOMEWORK #1

1. Section 5.5

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

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

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.

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

4.

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

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

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