5.5 Group Activity Problems - Solutions

45–74. Definite integrals *Use a change of variables or Table 5.6 to evaluate the following definite integrals.*

42. $\int (x^{3/2} + 8)^5 \sqrt{x}\, dx$

5.5.42 Let $u = x^{3/2} + 8$. Then $du = \frac{3}{2} \cdot \sqrt{x}\, dx$. Substituting gives $\frac{2}{3} \int u^5\, du = \frac{2}{3}\frac{u^6}{6} + C = \frac{(x^{3/2}+8)^6}{9} + C$.

66. $\int_1^{e^2} \frac{\ln p}{p}\, dp$

5.5.66 Let $u = \ln p$. Then $du = \frac{1}{p}\, dp$. Also note that when $p = 1$ we have $u = 0$, and when $p = e^2$ we have $u = 2$. Substituting yields $\int_0^2 u\, du = \left(\frac{u^2}{2}\right)\Big|_0^2 = 2$.

70. $\int_{-1}^{1} (x - 1)(x^2 - 2x)^7\, dx$

5.5.70 Let $u = x^2 - 2x$. Then $du = 2(x - 1)\, dx$. Also note that when $x = -1$ we have $u = 3$ and when $x = 1$ we have $u = -1$. Substituting yields $\frac{1}{2}\int_3^{-1} u^7\, du = \frac{1}{16}\left(u^8\right)\Big|_3^{-1} = \frac{1}{16}\left(1 - 3^8\right) = -\frac{6560}{16} = -410$.