Jacob Honoroff

H.W. #29 solutions: 7.8 2, 4, 8, 14, 23, 25, 36, 44, 46

2 a. $\int_{-1}^{1} \frac{e^u}{2}\, du$ c. $\int_0^1 \frac{u^2}{2}\, du$

b. $\int_1^2 u\, du$ d. $\frac{1}{2}\int_3^4 u^{3/2} - 3u^{1/2}$

4. $u = 4x-2$

definite integral: $\int_2^6 u^3\, du = \frac{u^4}{4}\Big]_2^6 = 80$

indefinite integral: $\int_1^2 (4x-2)^3 = \frac{4x-2}{16}\Big]_1^2 = \frac{64-24}{16} = 80$

8. $u = 4-x$
$du = -dx$

definite: $\int_9^4 -(4-u)(u)^{\frac{1}{2}} = \int_4^9 4u^{\frac{1}{2}} - u^{\frac{3}{2}}$

$= \frac{8}{3}u^{\frac{3}{2}} - \frac{2}{5}u^{\frac{5}{2}}\Big]_4^9$

$= -\frac{506}{15} \approx 33.733$

indefinite: $\int_{-5}^{0} 4(4-x)^{\frac{1}{2}} - (4-x)^{\frac{3}{2}}$

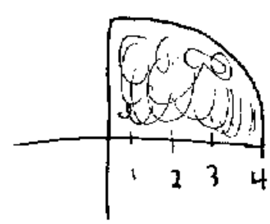
$= \frac{8}{3}(4-x)^{\frac{3}{2}} - \frac{2}{5}(4-x)^{\frac{5}{2}}\Big]_{-5}^{0}$

≈ 33.733

14. $u = x^2$
$\frac{du}{2} = dx$

$\Rightarrow \frac{1}{2}\left(\int_0^4 \sqrt{16-u^2}\, du\right) \Rightarrow$

quarter circle with radius 4



$= \frac{1}{2}\cdot\frac{1}{4}\cdot\pi\cdot(4)^2 = 2\pi$

23. $u = 3x+1$

$\frac{du}{3} = dx$

substitute $\Longrightarrow$ $\int_1^4 \frac{1}{3} u^{-\frac{1}{2}} = \frac{2}{3} u^{\frac{1}{2}} \Big]_1^4$

$= \frac{4}{3} - \frac{2}{3} = \frac{2}{3}$

25. $u = x^3 + 9$

$\frac{du}{3} = \cancel{x}^2\, dx$

substitute $\Longrightarrow$ $\int_8^{10} \frac{1}{3} u^{-\frac{1}{2}}\, du = \frac{2}{3} u^{\frac{1}{2}} \Big]_8^{10}$

$= \frac{2}{3}\left(\sqrt{10} - \sqrt{8}\right)$

36. $u = 5 + x$

$du = dx$ $\qquad x = u - 5$

$\Longrightarrow$ $\int_4^9 (u-5)(u^{-\frac{1}{2}})\, du = \int_4^9 u^{\frac{1}{2}} - 5u^{-\frac{1}{2}}\, du$

$= \frac{2}{3} u^{\frac{3}{2}} - 10\, u^{\frac{1}{2}} \Big]_4^9$

$= 8/3$

44. $u = 1 - x$ $\qquad x = 1 - u$

$du = -dx$

$\Longrightarrow$ $-\int_1^0 (1-u)\, u^n = \int_0^1 u^n - u^{n+1}$

$= \frac{u^{n+1}}{n+1} - \frac{u^{n+2}}{n+2} \Big]_0^1$

$= \frac{1}{n+1} - \frac{1}{n+2} = \frac{1}{(n+1)(n+2)}$

46. avg value $= \dfrac{\int_0^{10} 275{,}000\, e^{-0.17t}}{10}$

$= -\dfrac{275{,}000}{(10).17}\, e^{-.17t} \Big]_0^{10}$

$= -\dfrac{27{,}500}{.17}\, e^{-.17t} \Big]_0^{10}$

$= 161{,}764.71 - 29551.75$

$= 132{,}212.96$