Answers on front, brief solutions on back. Full solutions not included due to space constraints – email me or stop by office hours if there's a problem you still can't figure out.

$$\begin{aligned} 1. \ \frac{1}{2} \\ 2. \ x^2 e^{x^2} - e^{x^2} + C \\ 3. \ \frac{1}{5} (2x+3)^{5/2} - (2x+3)^{3/2} + C \\ 4. \ \frac{1}{2} x^2 + 2x + \ln |x| + C \\ 5. \ \frac{2}{3} 2^{3/2} - \frac{2}{3} \left(1 + \frac{1}{e}\right)^{3/2} \\ 6. \ \frac{1}{2} (\ln(3x))^2 + C \\ 7. \ \ln(x^3) \left(\frac{1}{3} x^3 + 5x\right) - \frac{1}{3} x^3 - 15x + C \\ 8. \ \frac{3}{5} x^{5/3} - \ln |x| + 5x + \frac{2}{3} x^{3/2} + 4e^{-x/4} + C \\ 9. \ \frac{2}{5} x^{5/2} - 2x^{1/2} + C \\ 10. \ \frac{4}{5} \\ 11. \ \frac{721}{52488} \left[= \frac{1}{9} \left(\frac{1}{2^3} - \frac{1}{9^3}\right) \right] \\ 12. \ \frac{74}{7} \left[= \left(\frac{4}{7} 4^{7/2} - 2 \cdot 4^{5/2}\right) - \left(\frac{4}{7} - 2\right) \right] \\ 13. \ \frac{1}{2} x^4 + \frac{2}{5} x^{5/2} + \frac{2}{3} x^3 + \frac{2}{3} x^{3/2} + C \\ 14. \ -te^{1-t} - e^{1-t} + C \\ 15. \ (5 + 3x + x^2) \left(-2e^{-x/2}\right) + 2 \left[(3 + 2x) \left(-2e^{-x/2}\right) - 8e^{-x/2} \right] + C \\ 16. \ \frac{1}{3} (3x^2 + 2x + 5)^{3/2} + C \\ 17. \ x (\ln x)^2 - 2 [x \ln x - x] + C \\ 18. \ 1 - \frac{1}{e} \\ 19. \ \frac{7}{20} \left[= -\frac{3}{20} + \frac{3}{6} \right] \\ 20. \ \frac{1}{9} (7 - 10e^{-3}) \left[= \left[(x + 2) \left(-\frac{1}{3}e^{-3x}\right) - \frac{1}{9}e^{-3x} \right] \right]_0^1 \end{aligned}$$

- 1. Use substitution with $u = \ln x$.
- 2. Either use substitution with $w = x^2$ then integration by parts with u = w, $dv = e^w dw$ or use integration by parts with $u = x^2$, $dv = 2xe^{x^2} dx$.
- 3. Use substitution with u = 2x + 3, then expand the product.
- 4. Expand the product.
- 5. Use substitution with $u = e^{-x} + 1$.
- 6. Use substitution with $u = \ln(3x)$.
- 7. Use integration by parts with $u = \ln(x^3), dv = x^2 + 5 dx$.
- 8. No tricks make sure you remember the basic rules for antidifferentiation!
- 9. Expand the product.
- 10. Use substitution with $u = \sqrt{x} 1$.
- 11. Use substitution with $u = x^3 + 1$.
- 12. Use substitution with u = x + 3, then expand the product.
- 13. Expand the product.
- 14. Use integration by parts with $u = t, dv = e^{1-t} dt$. You may want to use substitution to compute v.
- 15. Use integration by parts with $u = 5 + 3x + x^2$, $dv = e^{-x/2} dx$. For the subsequent integral, use integration by parts again, this time with u = 3 + 2x, $dv = e^{-x/2} dx$.
- 16. Use substitution with $u = 3x^2 + 2x + 5$.
- 17. Use integration by parts with $u = (\ln x)^2$, dv = dx. For the subsequent integral, use integration by parts again, this time with $u = \ln x$, dv = dx.
- 18. Use substitution with $u = t^2 1$.
- 19. Use substitution with $u = x^2 + 4x + 5$.
- 20. Use integration by parts with u = x + 2, $dv = e^{-3x} dx$.