Answers to Integral and Derivative Practice

1. (a) $\frac{\sqrt{2}}{2}t^2 - 5\ln(t) + \frac{4}{3}t^{3/2} + C$

   (b) $\frac{2}{5}u^{5/2} + \frac{12}{5}u^{1/2} - 2e^{7u} + C$

   (c) $\frac{2}{3}x^{3/2} + \frac{4}{x} + 2\ln(x) + C$

   (d) $-\frac{3}{x} - 2e^x + \frac{7}{2}x^2 + 3x + C$

   (e) $-\frac{1}{x^4} - \frac{15}{2}x^{2/3} + 10e^{x/5} + C$

   (f) $-\frac{3}{8t^2} - 9t^{2/3} + 3t^{1/3} + C$

   (g) $\frac{9}{4}$

   (h) $\frac{6544}{3}$

   (i) 12

   (j) 0

   (k) 1

   (l) 44

   (m) $-\frac{40}{3}$

2. **NOTE:** I simplified in a few places where it was easy to do so. You would not be expected to simplify.

   (a) $f'(x) = \frac{1}{2}(x^3e^x + 1)^{-1/2}\left[x^3e^x + e^x(3x^2)\right]$

   (b) $\frac{dz}{dx} = \frac{(y^2+5)\left[1+\ln(y)\right] - 2y^2\ln(y)}{(y^2+5)^2}$

   (c) $g'(t) = \frac{1}{\sqrt{t^3-2t+1}} \cdot \frac{1}{2}(t^3-2t+1)^{-1/2}(3t^2-2)$

   (d) $y' = xe^{x^3}(3x^2) + e^{x^3} + \frac{20x^4}{2+4x^5}$

   (e) $g'(t) = \frac{(\sqrt{2t+9})(e^{3t-4})(3) - (e^{3t-4})(2t+9)^{-1/2}}{2t+9}$

   (f) $Q'(r) = (\ln r)^3 \cdot 5(e^{4r^2}+2r)^4[e^{4r^2}(8r)+2] + (e^{4r^2}+2r)^5 \cdot 3(\ln r)^2 \cdot \frac{1}{r}$

   (g) $f'(x) = 6(1+2x\ln x)^5(2+2\ln x)$

   (h) $f'(t) = \frac{1}{2}\left[\ln(t^2-3t)+7\right]^{-1/2}\left(\frac{2t-3}{t^2-3t}\right)$

   (i) $\frac{du}{dx} = \frac{\left(x^2+\frac{1}{x}-7\right)\left[e^x\cdot\frac{1}{x}+e^x\ln x\right] - (e^x\ln x)\left(2x-\frac{1}{x^2}\right)}{\left(x^2+\frac{1}{x}-7\right)^2}$

   (j) $\frac{dy}{dx} = \frac{(x^5)(\sqrt{3x+1})\left(\frac{2x-4}{x^2-4x}\right) - \left[\ln(x^2-4x)\right]\left[(x^5)\cdot\frac{1}{2}(3x+1)^{-1/2}(3) + \sqrt{3x+1}(5x^4)\right]}{x^{10}(3x+1)}$

   (k) $h'(v) = \frac{(v^3-5v)(2v+3) - (v^2+3v)(3v^2-5)}{(v^3-5v)^2} + \left[v\cdot e^{2v}\cdot 2 + e^{2v}\right]$

   (l) $g'(t) = \frac{(2t+1)^{1/5}\cdot e^{(t^2-3t)}\cdot(2t-3) - e^{(t^2-3t)}\cdot\frac{1}{5}(2t+1)^{-4/5}(2)}{(2t+1)^{2/5}}$

   (m) $m'(v) = \frac{1}{\sqrt{v}e^{v^3}-v^2}\cdot\left[\sqrt{v}\cdot e^{v^3}\cdot 3v^2 + e^{v^3}\cdot\frac{1}{2}v^{-1/2} - 2v\right]$

(n) $A'(t) = 7(6t^3 + \ln t)^6 \left(18t^2 + \frac{1}{t}\right) + \frac{1+e^t}{t+e^t}$

(o) $\dfrac{dy}{dx} = \dfrac{x^5\left(4xe^x + 4e^x - \frac{2x}{x^2+3}\right) - \left[4xe^x - \ln(x^2+3)\right](5x^4)}{x^{10}}$

(p) $f'(x) = 5\left[1 + (\ln x)^3\right]^4 \cdot 3(\ln x)^2 \cdot \dfrac{1}{x}$

(q) HINT: Use the Fundamental Theorem to get a formula for $A(m)$ and then differentiate it: $A(m) = e^m - 10m^{1/2} - 1$

ANSWER: $A'(m) = e^m + \dfrac{5}{\sqrt{m}}$