Math 202(01) Solution
Quiz 1 4 February 2004

1. Let $g(x) = \displaystyle\int_2^{x^3} \frac{1}{1+\sqrt{t}}\,dt$. Find $g'(x)$.

   Solution: By the Fundamental Theorem of Calculus Part I, we have

$$\begin{aligned} g'(x) &= \frac{1}{1+\sqrt{x^3}} \cdot 3x^2 \\ &= \frac{3x^2}{1+x^{\frac{3}{2}}} \end{aligned}$$

2. Compute $\displaystyle\int_1^3 \frac{t+4}{t^3}\,dt$.

   Solution: We have

$$\begin{aligned} \int_1^3 \frac{t+4}{t^3}\,dt &= \int_1^3 t^{-2} + 4t^{-3}\,dt \\ &= \frac{t^{-1}}{-1} + \frac{4t^{-2}}{-2}\Big]_1^3 \\ &= -\frac{1}{t} - \frac{2}{t^2}\Big]_1^3 \\ &= \left(-\frac{1}{3} - \frac{2}{9}\right) - (-1-2) \\ &= \frac{22}{9} \end{aligned}$$

3. Find $\displaystyle\int x^2 e^{x^3+5}\,dx$

   Solution: Let $u = x^3 + 5$. Then $du = 3x^2\,dx$ so $\dfrac{1}{3}du = x^2\,dx$ and the integral becomes

$$\begin{aligned} \frac{1}{3}\int e^u\,du &= \frac{1}{3}e^u + C \\ &= \frac{1}{3}e^{x^3+5} + C \end{aligned}$$