

Substitution Exercises

These refer to **Brief Applied Calculus** by Berresford and Rockett, fourth edition.

Check each of your answers by differentiating!

1. Read Example 1 in §5.6.

(a) For $f(x) = x^{100} - x^{50} + 2$, find df .

(b) For $g(x) = e^x$, find dg .

2. Read Example 2 in §5.6.

(a) For $u = \ln(x^2 - 1)$, find du .

(b) For $u = e^{0.1t}$, find du .

(c) For $w = \frac{1}{z\sqrt{z}}$, find dw .

3. Read Example 3 in §5.6.

(a) Evaluate $\int (x^5 - 7)^{10} 5x^4 dx$ using the substitution $u = x^5 - 7$.

(b) Evaluate $\int \frac{5x^4}{(x^5 - 7)^3} dx$ using the substitution $u = x^5 - 7$.

(c) Evaluate $\int (x^4 + 12)^6 4x^3 dx$.

(d) Evaluate $\int \frac{4x^3}{(x^4 + 12)^2} dx$.

4. Read Example 4 in §5.6.

(a) Evaluate $\int (x^5 - 7)^{10} x^4 dx$ using the substitution $u = x^5 - 7$.

(b) Evaluate $\int \frac{x^4}{(x^5 - 7)^3} dx$ using the substitution $u = x^5 - 7$.

(c) Evaluate $\int (x^4 + 12)^6 x^3 dx$.

(d) Evaluate $\int \frac{x^3}{(x^4 + 12)^2} dx$.

5. Read Example 5 in §5.6.

(a) Evaluate $\int e^{t^2+1} t dt$ using the substitution $u = t^2 + 1$.

(b) Evaluate $\int x^4 e^{7x^5-9} dx$.

(c) Evaluate $\int (w^2 - 1) e^{w^3-3w} dw$.

6. Read Example 6 in §5.6.

(a) Evaluate $\int \frac{x^2}{x^3 + 5} dx$ using the substitution $u = x^3 + 5$.

(b) Evaluate $\int \frac{dt}{1-t}$ using the substitution $u = 1 - t$.

(c) Evaluate $\int \frac{x+4}{x^2+8x+1} dx$ using the substitution $u = x^2 + 8x + 1$.

(d) Evaluate $\int \frac{x^2 - 4x}{x^3 - 6x^2 - 5} dx$.

(e) Evaluate $\int \frac{e^t}{e^t - 1} dt$.

7. Read Example 7 in §5.6.

(a) Evaluate $\int x^4 \sqrt{x^5 - 7} dx$ using the substitution $u = x^5 - 7$.

(b) Evaluate $\int \frac{7x^6 - 5x^4}{\sqrt{x^7 - x^5}} dx$ using the substitution $u = x^7 - x^5$.

(c) Evaluate $\int x^3 \sqrt[3]{x^4 + 12} dx$.

(d) Evaluate $\int \frac{1 - e^x}{\sqrt{x - e^x}} dx$.

8. Read Example 8 in §5.6.

(a) Evaluate $\int e^{\sqrt[3]{t}} t^{-2/3} dt$ using the substitution $u = \sqrt[3]{t}$.

(b) Evaluate $\int \frac{e^{\sqrt[3]{x^2}}}{\sqrt[3]{x}} dx$.

9. Do Practice Problems 3 and 4 in §5.6.

10. (a) Evaluate $\int (2x - 3) \sqrt{x^2 - 3x + 8} dx$.

(b) Evaluate $\int \frac{2x - 3}{x^2 - 3x + 8} dx$.

(c) Evaluate $\int \frac{2x - 3}{(x^2 - 3x + 8)^2} dx$.