

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
DEPARTMENT OF MATHEMATICS AND STATISTICS

SECTION 1.1

Math 1001 Worksheet

WINTER 2023

SOLUTIONS

1. (a) $\int 10(5x+4)^8 dx = 10 \int (5x+4)^8 dx = 10 \cdot \frac{(5x+4)^9}{(5)(9)} + C = \frac{2}{9}(5x+4)^9 + C$

(b) $\int e^{(6-\frac{x}{2})} dx = \frac{1}{-\frac{1}{2}} e^{(6-\frac{x}{2})} + C = -2e^{(6-\frac{x}{2})} + C$

(c) $\int \frac{t^5 + 3t^3 + \sqrt{t}}{9t^4} dt = \int \left(\frac{t}{9} + \frac{1}{3t} + \frac{1}{9}t^{-\frac{7}{2}} \right) dt = \frac{t^2}{18} + \frac{1}{3} \ln|t| + \frac{1}{9} \left(\frac{t^{-\frac{5}{2}}}{-\frac{5}{2}} \right) + C$
 $= \frac{t^2}{18} + \frac{1}{3} \ln|t| - \frac{2}{45}t^{-\frac{5}{2}} + C$

(d) $\int [\sec^2(4x-1) + \sqrt{4x-1}] dx = \frac{1}{4} \tan(4x-1) + \frac{(4x-1)^{\frac{3}{2}}}{(4)(\frac{3}{2})} + C$
 $= \frac{1}{4} \tan(4x-1) + \frac{1}{6}(4x-1)^{\frac{3}{2}} + C$

(e) $\int \csc(\theta)[\csc(\theta) - \cot(\theta)] d\theta = \int [\csc^2(\theta) - \csc(\theta)\cot(\theta)] d\theta$
 $= -\cot(\theta) + \csc(\theta) + C$

(f) Recall that $\sin(2\theta) = 2\sin(\theta)\cos(\theta)$, so we can rewrite the given integral as

$$\int 4\sin(-4x)\cos(-4x) dx = 2 \int \sin(-8x) dx = -2 \frac{\cos(-8x)}{-8} + C$$
$$= \frac{1}{4} \cos(-8x) + C.$$

(g) We begin by expanding the numerator, and then dividing through by the denominator:

$$\int \frac{(1 + \frac{1}{x})(1 + \frac{4}{x})}{3x} dx = \int \frac{(1 + \frac{5}{x} + \frac{4}{x^2})}{3x} dx = \int \left(\frac{1}{3x} + \frac{5}{3}x^{-2} + \frac{4}{3}x^{-3} \right) dx$$
$$= \frac{1}{3} \ln|x| - \frac{5}{3}x^{-1} + \frac{4}{3} \cdot \frac{x^{-2}}{-2} + C$$
$$= \frac{1}{3} \ln|x| - \frac{5}{3x} - \frac{2}{3x^2} + C.$$

2. Note that $F'(x) = e^{\cos(x)} - x^3$ so $F'(0) = e^1 - 0 = e$.

3. $g(x) = \frac{d}{dx}[e^{\cos(x)} - x^3 + C] = e^{\cos(x)} \cdot \frac{d}{dx}[\cos(x)] - 3x^2 + 0 = -\sin(x)e^{\cos(x)} - 3x^2$