

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECTION 2.3

Math 1001 Worksheet

WINTER 2023

For practice only. Not to be submitted.

1. Use the First Fundamental Theorem to find $F'(x)$ for each of the following.

(a) $F(x) = \int_{-3}^x (t^2 + 3)^{\cos(t)} dt$

(b) $F(x) = \int_0^{\tan(x^2)} t dt$

(c) $F(x) = \int_{e^x}^{100} e^t dt$

(d) $F(x) = \int_{x^3}^x \sqrt{t} dt$

2. Repeat Question 2 from Worksheet 2.2 using the Second Fundamental Theorem.

(a) $\int_0^2 \frac{x^3}{4} dx$

(b) $\int_2^3 (2 - 7x) dx$

3. Evaluate the following definite integrals using the Second Fundamental Theorem.

(a) $\int_1^e (3x^{-3} + 5x^{-1} - 6x^2) dx$

(b) $\int_0^1 (x + 1)(2x - 3) dx$

(c) $\int_{\frac{\pi}{8}}^{\pi} \cos(2x) dx$

(d) $\int_2^0 (4t + 1)^{-\frac{5}{2}} dt$

(e) $\int_{-2}^0 \frac{3x + 8}{3x + 7} dx$

(f) $\int_{-2}^2 \frac{3 + 3x^2 - x^3}{x^2 + 1} dx$

(g) $\int_{-1}^{e^3-2} \frac{\ln(x+2)}{x+2} dx$

(h) $\int_0^\pi \cos(\cos(\theta)) \sin(\theta) d\theta$

(i) $\int_{\frac{1}{2}}^4 \frac{1}{x^2} \sqrt{2 + \frac{1}{x}} dx$

(j) $\int_{\frac{\pi}{2}}^{\frac{3\pi}{2}} \csc^2\left(\frac{x}{3}\right) \left[1 - e^{-\cot\left(\frac{x}{3}\right)}\right] dx$

(k) $\int_0^k x^2(k^3 - x^3)^{\frac{4}{3}} dx$ where k is a constant

(l) $\int_{\sqrt{3}}^{\sqrt{2}} \frac{1}{\sqrt{1 - \frac{x^2}{4}}} dx$

(m) $\int_0^4 \frac{1}{\sqrt{t(t+4)}} dt$

(n) $\int_{\sqrt{e}}^e \frac{1}{x \ln(x) \sqrt{16(\ln(x))^2 - 4}} dx$

(o) $\int_1^3 \frac{\ln(x)}{x^4} dx$

(p) $\int_{\arcsin\left(\frac{3}{5}\right)}^{\frac{\pi}{2}} \cos(x) \ln(\sin(x)) dx$

(q) $\int_0^1 x \arcsin(x^2) dx$

(r) $\int_{-5}^{-1} |2x + 8| dx$

(s) $\int_{-1}^4 |x^2 - 4x + 3| dx$

4. Use the Second Fundamental Theorem to find the area under the curve $y = \frac{2}{\sqrt{2x - \frac{3}{2}}}$ on the interval $\left[\frac{11}{4}, \frac{35}{4}\right]$.