MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECTION 2.3 | **Math 1001 Worksheet** | WINTER 2024

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) $\displaystyle\int_0^{\pi} \cos(\cos(\theta))\sin(\theta)\,d\theta$

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

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

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

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

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

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

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

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

(q) $\displaystyle\int_0^{1} x\arcsin(x^2)\,dx$

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

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

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