MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECTION 1.4 **Math 1001 Worksheet** WINTER 2024

For practice only. Not to be submitted.

1. Evaluate each indefinite integral using integration by parts.

   (a) $\int x\cos(x)\,dx$

   (b) $\int x^2\cos(x)\,dx$

   (c) $\int x\tan(x)\sec(x)\,dx$

   (d) $\int y^7 e^{y^4}\,dy$

   (e) $\int e^{3x}\sin(5x)\,dx$

   (f) $\int \cos(x)\cos\left(\frac{2x}{3}\right)\,dx$

   (g) $\int \arcsin(6x)\,dx$

2. Evaluate each of the following integrals using any combination of elementary integrals, integrals leading to inverse trigonometric functions, u-substitution and integration by parts.

   (a) $\int \frac{x}{\sqrt{x^2-9}}\,dx$

   (b) $\int \frac{1}{x\sqrt{x^2-9}}\,dx$

   (c) $\int x\csc^2(9x)\,dx$

   (d) $\int x^4 e^{x^5}\,dx$

   (e) $\int x^9 e^{x^5}\,dx$

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(f) $\displaystyle\int \frac{1}{9x^2 - 12x + 8}\,dx$

(g) $\displaystyle\int e^{4x}\cos(x)\,dx$

(h) $\displaystyle\int \frac{12x^2 - 32x + 14}{2x - 5}\,dx$

(i) $\displaystyle\int \frac{1}{x\sqrt{4 - \ln^2(x)}}\,dx$

(j) $\displaystyle\int \cos^2(x)[1 + \tan^2(x)]\,dx$

3. (a) Use integration by parts to prove the reduction formula

$$\int \sin^n(x)\,dx = -\frac{1}{n}\cos(x)\sin^{n-1}(x) + \frac{n-1}{n}\int \sin^{n-2}(x)\,dx,$$

where n is a positive integer.

(b) Use this formula to evaluate $\displaystyle\int \sin^7(x)\,dx$.