



## Handout 11



## MATH 140 Lab: Section 1

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Student's Name: Mohammed KaabarStudent's ID: - Solution -*Note: This handout contains a review for definite integrals and integration by parts.***Problem 1: Evaluate the following integral:**

$$\int_1^2 x^3 \sqrt{x^4 + 5} dx$$

$$u = x^4 + 5$$

$$du = 4x^3 dx \Leftrightarrow \frac{du}{dx} = 4x^3$$

$$\Rightarrow \int_1^2 x^3 \sqrt{x^4 + 5} dx = \frac{1}{4} \int u^{1/2} du = \frac{1}{4} \frac{u^{3/2}}{3/2} = \frac{1}{4} \frac{(x^4 + 5)^{3/2}}{3/2} \Big|_1^2 = \frac{1}{4} \left( (13)^{3/2} - (6)^{3/2} \right)$$

**Problem 2: Evaluate the following integral:**

$$\int_1^e \frac{(\ln(x))^2}{x} dx$$

$$u = \ln x$$

$$\frac{du}{dx} = \frac{1}{x} \Rightarrow du = \frac{1}{x} dx$$

$$\int_1^e \frac{(\ln(x))^2}{x} dx = \int u^2 du = \frac{u^3}{3} = \frac{(\ln x)^3}{3} \Big|_1^e$$

$$= \frac{1}{3} - 0 = \boxed{\frac{1}{3}}$$

Problem 3: Evaluate the following integral:

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

1	∫
$x^2$	$\oplus \cos(x)$
$2x$	$\ominus \sin(x)$
$2$	$\oplus -\cos(x)$
$0$	$\ominus -\sin(x)$

$$\int x^2 \cos(x) dx = x^2 \sin(x) + 2x \cos(x) - 2 \sin(x) + C$$