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| MATH241 Chapter 5 Practice |
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**Problem 1:** Use the Fundamental Theorem of Calculus to find the derivatives of the following functions:

(a)  $g(x) = \int_1^x \frac{\ln(t)}{t} dt$

(b)  $g(x) = \int_x^{x^2} \frac{\ln(t)}{t} dt$  (hint: can we try to find a point  $c$  to split up the integral?)

**Solution:**

**Problem 2:** Evaluate the following integrals:

(a)  $\int_0^4 (3 \cos(x) + e^{2x}) dx$

(b)  $\int_{-1}^1 (3^x + \cosh(x)) dx$

**Solution:**

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**Problem 3:** Let  $v(t) = t^3 - 4t^2 + 17$  be the velocity function for a particle moving along a line. Find:

- (a) the indefinite integral of  $v(t)$ , i.e.  $\int v(t)dt$ ;
- (b) the displacement of the particle from time 0 to time 5;
- (c) the total distance traveled by the particle in the time interval  $0 \leq t \leq 5$ .

**Solution:**

**Problem 4:** Use  $u$ -substitution to find the following integrals:

- (a)  $\int \frac{\sin(\frac{1}{x})}{x^2} dx$ ;
- (b)  $\int \frac{\sin(\theta) \cos(\theta)}{1 + \sin^2(\theta)} d\theta$
- (c)  $\int \frac{\sec^2(x)}{9 + \tan^2(x)} dx$