

NAME: _____

Problem 1. Use the properties of definite integrals to solve the integrals.

a) Given $\int_1^0 \ln(x)dx = \int_1^e \ln(x)dx$, find $\int_0^e \ln(x)dx$.

b) Given $\int_0^a x^3 dx = \frac{a^4}{4}$ find $\int_1^2 2x^3 dx$.

c) Given $\int_0^a x^4 dx = \frac{a^5}{5}$, find $\int_{-1}^1 \frac{x^4}{2} dx$.

d) Given $\int_0^a \sin(x)dx = 1 - \cos(a)$ and that $f(x) = \sin(x)$ is an odd function (this means that $\sin(-x) = -\sin(x)$), find $\int_1^\pi \sin(-x)dx$.

Problem 2. Use Leibniz's rule to solve the following integrals.

$$\text{a) } \frac{d}{dx} \left[\int_1^x (1+t) dt \right]$$

$$\text{b) } \frac{d}{dx} \left[\int_x^3 (1+t) dt \right]$$

$$\text{c) } \frac{d}{dx} \left[\int_{2-x^2}^{x+x^3} (t^2 - 1) dt \right]$$

$$\text{d) } \frac{d}{dx} \left[\int_{x^3-2x}^{1+x^2} (t+1) dt \right]$$