

Name: \_\_\_\_\_

Solve the following problems.

1. Compute  $\int x \ln(x) dx$ .

2. Compute  $\int \arctan(x) dx$ .

3. Compute  $\int \cos^2(x) \sin^2(x) dx$ .

4. Compute  $\int \sin^5(x) dx$ .

5. (a) Compute

$$\int_0^{\pi} \cos(x) dx \quad \text{and} \quad \int_0^{\pi} x^2 \cos(x) dx.$$

(b) Use the identity

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

and part (a.) to compute  $\int_0^{\pi} x^4 \cos(x) dx$ .

(c) Show that

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

Hint: the steps are very similar to the steps used to compute  $\int_0^{\pi} x^2 \cos(x) dx$  in (a.).