

MATH 222 WORKSHEET 13 - FEBRUARY 20, 2013

1. Compute each of the following integrals.

(a) $\int_0^\pi x \cos x \, dx$

(b) $\int \frac{x+3}{(x-1)(x^2+1)} \, dx$

(c) $\int \sin^3 \theta \, d\theta$

(d) $\int \frac{\sqrt{x^2-4}}{x^3} \, dx$

(e) $\int e^{2x} \cos x \, dx$

(f) $\int \frac{8 \, dx}{x^3 + 2x^2 + 2x}$

(g) $\int \sin^2(3x) \, dx$

2. Let $I_n = \int (\ln x)^n \, dx$. *Be careful!* You're integrating $(\ln x)^n$, not $\ln(x^n)$.

(a) Find I_0 .

(b) Find a reduction formula for I_n .

(c) Use the reduction formula to find I_1 , I_2 , and I_3 .

3. Compute each of the following improper integrals, or else show they don't exist.

(a) $\int_0^1 \frac{dx}{\sqrt{1-x^2}}$

(b) $\int_{-\infty}^0 e^{-x} dx$

(c) $\int_0^1 \frac{dx}{x^2}$

(d) $\int_0^{\infty} \frac{3 dx}{x^2 + 5x + 4}$

(e) $\int_{-\infty}^{\infty} \frac{dx}{(1+x^2)^2}$

4. Determine whether each of the following improper integrals exist. Do not attempt to actually compute them.

(a) $\int_1^{\infty} \frac{x^2}{(x^2+x+1)^2} dx$

(b) $\int_1^{\infty} \frac{dx}{\sqrt{x}+1}$

(c) $\int_0^{\infty} \frac{dx}{1+x^3}$

(d) $\int_0^{\infty} \frac{x^5+1}{x^6+1} dx$