

MATH 222 WORKSHEET 12 - FEBRUARY 18, 2013

1. Compute each of the following integrals.

(a) $\int x^2 e^{-x} dx$

(b) $\int_0^\pi \sin^2(3\theta) d\theta$

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

(d) $\int \frac{2x^3 + 8x^2 + 8x + 4}{x^2 + 4x + 3} dx$

(e) $\int x^{1/2} \ln x dx$

(f) $\int \frac{dx}{(4x^2 + 9)^{3/2}}$

(g) $\int \frac{dx}{\sqrt{8 + 4x - x^2}}$

2. Let $I_n = \int x^n e^x dx$

(a) Find a reduction formula for I_n with $n \geq 1$.

(b) Use the formula for find $A_n = \int_0^1 x^n e^x dx$ for $n = 1, n = 2, n = 3,$
and $n = 4$.

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

(a) $\int_0^{\infty} \frac{x \, dx}{x+1}$

(b) $\int_e^{\infty} \frac{dx}{x \ln x}$

(c) $\int_0^{\infty} e^{-2x} \, dx$

(d) $\int_0^1 x^{-1/3} \, dx$

(e) $\int_0^{\infty} e^{-x} \cos x \, dx$

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

(a) $\int_1^{\infty} \frac{dx}{2x^2 - \sqrt{x}}$

(b) $\int_1^{\infty} \frac{e^{-x^2}}{x} \, dx$

(c) $\int_0^{\pi/4} \frac{\ln x}{\cos x}$

(d) $\int_{-\infty}^{\infty} \frac{\cos^2 x}{1+x^2}$