

Mat 1322 3X – Summer 2007 – Homework #1.

To hand in Thursday, May 17th.

Question 1. (9 points) Compute the following integrals:

$$(i) \int \frac{x^3 + x^2 + 4}{x^2 + 2x + 5} dx \quad (ii) \int \frac{x - 2}{(2x^2 + x + 2)(x + 1)^2} dx \quad (iii) \int \frac{x^3}{(x + 7)^3} dx$$

Question 2. (4 points) Computes the following integrals:

$$(i) \int_{-1}^1 x^2 \arctan(x^3 + 1) dx \quad (ii) \int_0^{\frac{1}{2}} \frac{3}{\sqrt{2x - x^2}}$$

Question 3. Note that $1 + x^4 = (1 - \sqrt{2}x + x^2)(1 + \sqrt{2}x + x^2)$. Then:

a. (3 points) Compute the following integral:

$$\int \frac{du}{1 + u^4}$$

b. (3 points) Use the comparison test to show that

$$\int_0^{\infty} \frac{dx}{(1 + x^2)\sqrt{x}}$$

converges.

c. (2 points) Using substitution $u = \sqrt{x}$, compute the value of the previous integral.

Question 4. (8 points) Study the convergence of each integral, and give the value for those that converge.

$$(i) \int_1^4 \frac{1}{(x - 2)^{2/3}} dx \quad (ii) \int_{\pi/6}^{\pi/2} \frac{1}{\tan x} dx \quad (iii) \int_2^{+\infty} \frac{e^{-x}}{3 + e^{-x}} dx \quad (iv) \int_3^{+\infty} \frac{dx}{x^3 \sqrt{\ln x}}$$

Question 5 (8 points) Use the comparison test to determine the convergence of the following integrals:

$$(i) \int_1^{\infty} \frac{1}{\sqrt{x} + e^{2x}} dx \quad (ii) \int_0^{\infty} \frac{\sqrt{1 + \sqrt{x}}}{\sqrt{x}} dx \quad (iii) \int_0^1 \frac{dx}{\sqrt[3]{x^4 + x^8}} \quad (iv) \int_0^{\pi/2} \frac{dx}{x^3 \cos^2 x}$$