

University of Bahrain
Department of Mathematics
MATHS122: Calculus II
Spring 2016
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Worksheet 6: Improper Integrals

Students' Name: _____

1. Determine whether the following integrals converges or diverges. If it converges, find the value of the integral.

1. $\int_1^{\infty} \frac{1}{x\sqrt{x^2-1}} dx$

2. $\int_{-\infty}^0 xe^x dx$

$$3. \int_{-\infty}^{\infty} \frac{1}{(x^2 + 1)^{\frac{3}{2}}} dx$$

$$4. \int_0^3 \frac{1}{\sqrt{3-x}} dx$$

$$5. \int_{-1}^0 \frac{1}{\sqrt{1-x^2}} dx$$

$$6. \int_{-16}^1 \frac{1}{\sqrt[4]{x}} dx$$

$$7. \int_{-\infty}^{\infty} e^{|x|} dx$$

$$8. \int_0^{\infty} \frac{1}{x^2} dx$$

2. Use Comparison test to the following integrals for convergence.

1. $\int_1^{\infty} \frac{x}{x^3 + 1} dx$

2. $\int_0^{\pi} \frac{\sin^2 x}{\sqrt{x}} dx$

3. $\int_1^{\infty} \frac{2 + e^{-x}}{x} dx$

3. $\int_{-\infty}^{\infty} f(x) dx$ **may not equal** $\lim_{b \rightarrow \infty} \int_b^b f(x) dx$.

1. Show that $\int_{-\infty}^{\infty} \frac{2x}{x^2 + 1} dx$ diverges.

2. Show that $\lim_{b \rightarrow \infty} \int_{-b}^b \frac{2x}{x^2 + 1} dx = 0$