

### Worksheet #35: Improper Integrals I

#### Useful Formulas:

If  $f$  continuous over the infinite interval  $[a, +\infty)$ , then improper integral of  $f$  is defined as

$$\int_a^{+\infty} f(x)dx = \lim_{l \rightarrow +\infty} \int_a^l f(x)dx.$$

If  $f$  is continuous on the interval  $[a, b]$ , except for an infinite discontinuity at  $a$ , then the improper integral of  $f$  over the interval  $[a, b]$  is defined as

$$\int_a^b f(x)dx = \lim_{l \rightarrow a^+} \int_l^b f(x)dx.$$

*The improper integral is said to **converge** if the **limit exists** and **diverge** if the **limit does not exist**.*

Evaluate the following integrals.

1. 
$$\int_0^{+\infty} 2xe^{-x^2} dx$$

2. 
$$\int_e^{+\infty} \frac{1}{x \ln^5 x} dx$$

3. 
$$\int_4^6 \frac{3}{(x-4)^2} dx$$