# §7.8 Improper Integrals

## In-class Activity 7.8

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### Activity 1:

$C$ or $D$? That is, do the following improper integrals converge or diverge? If they converge, find their value.

(a) $\displaystyle\int_1^\infty \frac{1}{x}\,dx$

(b) $\displaystyle\int_{-\infty}^1 xe^x\,dx$

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

## Activity 2:

Investigate numerically using Sage whether $\int_1^\infty e^{-x^2}\,dx$ converges or diverges. If it appears to converge, estimate it's value.

## Activity 3:

$C$ or $D$? That is, do the following improper integrals converge or diverge? If they converge, find their value.

(a) $\displaystyle\int_0^9 \frac{1}{\sqrt{x}}\,dx$

(b) $\displaystyle\int_0^1 \frac{1}{x}\,dx$

(c) $\displaystyle\int_0^2 \frac{1}{\sqrt[3]{(x-1)^2}}\,dx$

## Activity 4:

$C$ or $D$? That is, do the following improper integrals converge or diverge? If they converge, find their value.

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

(b) $\displaystyle\int_0^{\pi/2} \sec(x)\,dx$

## Activity 5:

Use the comparison test to show that $\int_{-\infty}^{\infty} e^{-x^2}\,dx$ converges.
*(Hint: split into three integrals: $\int_{-\infty}^{-1} + \int_{-1}^{1} + \int_{1}^{\infty}$. Use the comparison test with $e^{-x^2} \leq e^{-x}$.)*

## Activity 6:

Use the comparison test to determine whether the integral converges or diverges.

(a) $\displaystyle\int_1^{\infty} \frac{1}{\sqrt{x^3+1}}\, dx$

(b) $\displaystyle\int_1^{\infty} \frac{1}{e^{3x}+\sqrt{x}}\, dx$

(c) $\displaystyle\int_1^{\infty} \frac{1+\sin^2(x)}{\sqrt{x}}\, dx$