

# Math 426.2SY

## Calculus II

University of New Hampshire

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# Outline

## 1 Section 8.7 Comparison Tests

# Tests for convergence and Divergence

## Example

Does  $\int_1^{\infty} e^{-x^2} dx$  converge?

# Tests for convergence and Divergence

## Direct Comparison Test (DCT)

Let  $f(x)$  and  $g(x)$  be continuous with  $0 \leq f(x) \leq g(x)$  for all  $x \geq a$ .

- If  $\int_a^\infty g(x) dx$  converges, then  $\int_a^\infty f(x) dx$  converges.
- If  $\int_a^\infty f(x) dx$  diverges, then  $\int_a^\infty g(x) dx$  diverges.

# Tests for convergence and Divergence

## Example

Does  $\int_1^{\infty} \frac{\sin^2(x)}{x^2} dx$  converge?

# Tests for convergence and Divergence

## Example

Does  $\int_1^{\infty} \frac{1}{\sqrt{x^2 - 0.1}} dx$  converge?

# Tests for convergence and Divergence

## Limit Comparison Test (LCT)

If  $f(x)$  and  $g(x)$  are positive continuous functions and  $\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)} = L$  with  $0 < L < \infty$  then  $\int_a^\infty f(x) dx$  and  $\int_a^\infty g(x) dx$  either both converge or they both diverge (they behave the same).

# Tests for convergence and Divergence

## Example

Does  $\int_1^{\infty} \frac{1}{x^2 + 1} dx$  converge?



# Tests for convergence and Divergence

## Example

Does  $\int_1^{\infty} \frac{\sqrt{x+1}}{x^2} dx$  converge?