MAT137 - Calculus with proofs

- Test 4 opens on March 12
- Today: Limit Comparison Test
- Monday: Series!
  - **Watch videos 13.2, 13.3, 13.4**
  - Supplementary video: 13.1

Rapid questions: convergent or divergent?

1. $\displaystyle\int_1^\infty \frac{1}{x^2}\,dx$
2. $\displaystyle\int_1^\infty \frac{1}{\sqrt{x}}\,dx$
3. $\displaystyle\int_1^\infty \frac{1}{x}\,dx$
4. $\displaystyle\int_0^1 \frac{1}{x^2}\,dx$
5. $\displaystyle\int_0^1 \frac{1}{\sqrt{x}}\,dx$
6. $\displaystyle\int_0^1 \frac{1}{x}\,dx$

A "simple" integral

What is $\int_{-1}^{1} \frac{1}{x}\,dx$?

1. $\int_{-1}^{1} \frac{1}{x}\,dx = (\ln|x|)\Big|_{-1}^{1} = \ln|1| - \ln|-1| = 0$

2. $\int_{-1}^{1} \frac{1}{x}\,dx = 0$ because $f(x) = \frac{1}{x}$ is an odd function.

3. $\int_{-1}^{1} \frac{1}{x}\,dx$ is divergent.

Slow questions: convergent or divergent?

1. $\displaystyle\int_1^\infty \frac{x^3+2x+7}{x^5+11x^4+1}\,dx$

2. $\displaystyle\int_1^\infty \frac{x+2}{\sqrt{x^4+x+1}}\,dx$

3. $\displaystyle\int_1^\infty \frac{1}{x^2+\sqrt{x}}\,dx$

4. $\displaystyle\int_0^1 \frac{1}{x^2+\sqrt{x}}\,dx$

5. $\displaystyle\int_0^1 \frac{\sin x}{x^{3/2}}\,dx$

6. $\displaystyle\int_2^\infty \frac{(\ln x)^{10}}{x^2}\,dx$