MAT137Y1 – LEC0501
Calculus!

SOME LIMIT COMPUTATIONS

UNIVERSITY OF
TORONTO

October 15$^{\text{th}}$, 2018

For next lecture

For Wednesday (Oct 17), watch the videos:

- IVT and EVT: 2.21, 2.22
- Definition of a derivative: 3.1, 3.2, 3.3

Computations!

Using that $\lim\limits_{x \to 0} \dfrac{\sin x}{x} = 1$, compute the following limits:

1. $\lim\limits_{x \to 2} \dfrac{\sin x}{x}$

2. $\lim\limits_{x \to 0} \dfrac{\sin(5x)}{x}$

3. $\lim\limits_{x \to 0} \dfrac{\tan^2(2x^2)}{x^4}$

4. $\lim\limits_{x \to 0} \dfrac{\sin e^x}{e^x}$

5. $\lim\limits_{x \to 0} \dfrac{1 - \cos x}{x}$

6. $\lim\limits_{x \to 0} \dfrac{\tan^{10}(2x^{20})}{\sin^{200}(3x)}$

Limits at infinity

Compute:

1. $\lim\limits_{x \to \infty} \left(x^7 - 2x^5 + 11 \right)$

2. $\lim\limits_{x \to \infty} \left(x^2 - \sqrt{x^5 + 1} \right)$

3. $\lim\limits_{x \to \infty} \dfrac{x^2 + 11}{x + 1}$

4. $\lim\limits_{x \to \infty} \dfrac{x^2 + 2x + 3}{3x^2 + 4x + 5}$

5. $\lim\limits_{x \to \infty} \dfrac{x^3 + \sqrt{2x^6 + 1}}{2x^3 + \sqrt{x^5 + 1}}$

6. $\lim\limits_{x \to \infty} \dfrac{\sin(2x + 7)\cos\left(x^2\right) + \cos^2\left(4 - x^3\right)}{x}$

Rational limits

Compute:

1 $\lim\limits_{x \to -3} \dfrac{x^2 - 9}{3 - 2x - x^2}$ 　　　 **2** $\lim\limits_{x \to 1^+} \dfrac{x^2 - 9}{3 - 2x - x^2}$

Computations

1 $\lim\limits_{x \to 0} \dfrac{1}{x} \left(\sqrt{1 + x + x^2} - 1 \right)$ 　　 **2** $\lim\limits_{x \to \pi} \dfrac{\sin^2(x)}{1 + \cos(x)}$