

**Homework #5****Due Wednesday, February 23rd in Gradescope by 11:59 pm ET****Goal:** Exploring Limits using L'Hôpital's Rule, and solidify size arguments

Compute each of the following Limits. Simplify.

1.  $\lim_{\theta \rightarrow \frac{\pi}{2}} \frac{1 - \sin \theta}{1 + \cos(2\theta)}$

2.  $\lim_{x \rightarrow \infty} \frac{\ln x}{\sqrt{x}}$

3.  $\lim_{x \rightarrow 0^+} \frac{\ln x}{x}$

4.  $\lim_{x \rightarrow 0} \frac{e^{2x} - 1 - 2x}{x^2}$

5.  $\lim_{x \rightarrow 0} \frac{\sinh x - x}{x^3}$

6.  $\lim_{x \rightarrow 0} \frac{e^x - e^{-x} - 2x}{x - \sin x}$

7.  $\lim_{x \rightarrow 0} \frac{\arcsin(3x)}{\arctan(4x)}$

8.  $\lim_{x \rightarrow 0} \frac{x - \arcsin x}{\arctan(2x) - 2x}$

9.  $\lim_{x \rightarrow 0} \frac{3xe^x - \arctan(3x)}{x + \ln(1 - x)}$

10.  $\lim_{x \rightarrow 0} \frac{\arcsin x + x^2 - x}{\cosh x - \arctan(5x) - e^{-5x}}$

11.  $\lim_{x \rightarrow \infty} x \sin\left(\frac{\pi}{x}\right)$

12.  $\lim_{x \rightarrow \infty} x \ln\left(1 - \frac{1}{x}\right)$

13.  $\lim_{x \rightarrow 0^+} x \ln x$

14.  $\lim_{x \rightarrow 0^+} \sqrt{x} \ln x$

15.  $\lim_{x \rightarrow \infty} x^2 e^{-x}$

16.  $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x$

17.  $\lim_{x \rightarrow 0^+} (1 + \ln(1 - 3x))^{\frac{1}{x}}$

18.  $\lim_{x \rightarrow \infty} \left(1 - \arctan\left(\frac{7}{x^4}\right)\right)^{x^4}$

# REGULAR OFFICE HOURS

Sunday: 6–7:30 pm TA Nico, SMUDD 207

**Monday: 1:00–3:00 pm**

6–7:30 pm TA Daksha, SMUDD 207

7:30–9:00 pm TA Karime, SMUDD 207

**Tuesday: 12:00–4:00 pm**

6–7:30 pm TA Ian, SMUDD 207

7:30–9:00 pm TA Nico, SMUDD 207

**Wednesday: 1:00–3:00 pm**

9–10:30 pm TA Daksha, SMUDD 207

**Thursday: none for Professor**

6–7:30 pm TA Ian, SMUDD 207

7:30–9:00 pm TA Karime, SMUDD 207

**Friday: 12:00–2:00 pm**

Please e-mail with questions/concerns: [dbenedetto@amherst.edu](mailto:dbenedetto@amherst.edu)

Start early.

Show all details and justifications in a nice final draft. No Mess.

Box your answers.