WORKSHEET 20

Spring 2020

MORE L'HÔPITAL & LINEAR APPROXIMATION

7 April 2020

- 1. (Review:) Using the limit definition of the derivative, find the derivative of $f(x) = 3x^2 + x$.
- 2. (Warm-up:) Evaluate the following limit using L'Hôpital's rule: $\lim_{x \to 0} \frac{\sin(2x) x}{3x}.$
- 3. Evaluate $\lim_{x \to \infty} x^{\frac{1}{x}}$.
- 4. Find the linear approximation for e^x at x = 1, and use it to estimate the value of $e^{1.1}$.
- 5. A sample of bacteria is growing in a petri dish. If the sample grows outwards in a circle, what is the approximate change in the area that the bacteria covers as the radius changes from 3 cm to 3.1 cm?
- 6. Evaluate $\lim_{x \to 0^+} \sin(x)^{\frac{1}{x^2}}$.
- 7. Evaluate $\lim_{x \to 2^+} \left(\frac{1}{x-2} \frac{1}{\ln(x-1)} \right)$.
- 8. (Group 1) Suppose that the outside temperature at t hours after 9:00am is given by $10\sin\left(\frac{\pi}{12}t\right) + 60$. Without using a calculator, estimate the temperature at 9:02pm.
- 9. (Group 2) If a spherical balloon is measured to have radius 10 cm, with a potential error of up to 0.01 cm, what is the maximum possible error in volume?