Math 114 Spring 2019
Calculus I Practice Homework 8.5 Solutions
Do not turn in

Note that the odd-numbered problems in Stewart have solutions in the back of the book.

1. Stewart 3.7.25
2. Stewart 3.7.27
3. Stewart 3.7.33
4. Stewart 2.7.35
5. Compute $\lim_{x \to 3} \dfrac{x^2 + x - 2}{x - 1}$

   Solution: We can just plug in, and get $\frac{9+3-1}{2} = 5$. Notably, L'Hôpital's rule does not apply here since the fraction is not an indeterminate form.
6. Stewart 4.7.1
7. Stewart 4.7.3
8. Stewart 4.7.9
9. Stewart 4.7.27
10. Stewart 4.7.47

    For each of the following problems, do three iterations by hand.
11. Stewart 4.6.7
12. Stewart 4.6.11
13. Stewart 4.6.13
14. Stewart 4.6.15
15. Stewart 4.6.17

16. Find a formula for the quadratic approximation of $x\sin(2x)$ near $x = 0$.

Solution: We have

$$\begin{aligned} f(x) &= x\sin(2x) & f(0) &= 0 \\ f'(x) &= \sin(2x) + 2x\cos(2x) & f'(0) &= 0 \\ f''(x) &= 2\cos(2x) + 2\cos(2x) - 4x\sin(2x) = 4 \end{aligned}$$

and thus

$$f(x) \approx 0 + 0(x-0) + \frac{4}{2}(x-0)^2 = 2x^2.$$

17. Find a formula for the quadratic approximation of $x^2 + 3x - 5$ near $x = 3$.

Solution:

$$\begin{aligned} f(x) &= x^2 + 3x - 5 & f(3) &= 13 \\ f'(x) &= 2x + 3 & f'(3) &= 9 \\ f''(x) &= 2 & f''(3) &= 2 \end{aligned}$$

so

$$f(x) \approx 13 + 9(x-3) + \frac{2}{2}(x-3)^2.$$

In fact this is exactly correct; we've rewritten our polynomial in terms of $(x-3)$ instead of x.

18. Find a formula for the quadratic approximation of $\sec(x)$ near $x = \pi/4$.

Solution:

$$\begin{aligned} f(x) &= \sec(x) & f(\pi/4) &= \sqrt{2} \\ f'(x) &= \sec(x)\tan(x) & f'(\pi/4) &= \sqrt{2} \\ f''(x) &= \sec^2(x)\tan(x) + \sec^3(x) & f''(\pi/4) &= 2 + 2\sqrt{2} \end{aligned}$$

so

$$f(x) \approx \sqrt{2} + \sqrt{2}(x - \pi/4) + (1 + \sqrt{2})(x - \pi/4)^2.$$