

Math 114 Spring 2019  
Calculus I HW 1 Solutions  
Due Wednesday, January 30  
(Updated Jan 25)

1. Give a zeroth-order approximation to  $\sqrt[3]{30}$ . Explain your answer in a few words.

**Solution:** The function  $\sqrt[3]{x}$  is continuous, and 30 is close to 27. so we expect  $\sqrt[3]{30}$  to be close to  $\sqrt[3]{27} = 3$ .

2. Give a zeroth-order approximation to  $\tan(.03)$ . Explain your answer in a few words.

**Solution:** The function  $\tan(x)$  is continuous, and .03 is close to 0, so we expect  $\tan(.03)$  to be close to  $\tan(0) = 0$ .

3. Stewart 1.4.12

4. Stewart 1.4.14

5. Stewart 1.4.18

6. Stewart 1.4.22

7. Stewart 1.4.24

8. Stewart 1.4.26

9. (★) Stewart 1.5.6

10. (★) Stewart 1.5.8

11. Stewart 1.5.16

12. Let

$$f(x) = \begin{cases} x + 3 & x > 2 \\ x^2 + 1 & x < 2 \end{cases}$$

Define a function that extends  $f$  and is continuous at all real numbers.

**Solution:** Define

$$f_F(x) = \begin{cases} x + 3 & x > 2 \\ x^2 + 1 & x < 2 \\ 5 & x = 2 \end{cases}$$

Then  $f_F$  is continuous at 2 since  $\lim_{x \rightarrow 2^-} f_F(x) = \lim_{x \rightarrow 2} x^2 + 1 = 5$  and  $\lim_{x \rightarrow 2^+} f_F(x) = \lim_{x \rightarrow 2} x + 3 = 5$ .

13. Let

$$g(x) = \begin{cases} x^2 - 5 & x > -1 \\ 4x & x < -1 \end{cases}$$

Define a function that extends  $g$  and is continuous at all real numbers.

**Solution:** Define

$$g_F(x) = \begin{cases} x^2 - 5 & x > -1 \\ 4x & x < -1 \\ -4 & x = -1 \end{cases}$$

Then  $g_F$  is continuous at  $-1$  since  $\lim_{x \rightarrow -1^-} g_F(x) = \lim_{x \rightarrow -1} 4x = -4$  and  $\lim_{x \rightarrow -1^+} g_F(x) = \lim_{x \rightarrow -1} x^2 - 5 = -4$ .

14. Stewart 1.5.30