

PROBLEM SET II

CALCULUS I ♦ MAT 181-050 ♦ FALL 2018

September 7, 2018

DUE: THURSDAY, SEPTEMBER 13, 2018

READ: SECTIONS 2.1-2.4

Handwritten signature: "Hutson!"

INSTRUCTIONS: All solutions should be prepared carefully, recopied in a neat final form, and presented in the order given. All solution sets shall be completed on white paper and stapled (unlined paper is preferred). Careless presentation (e.g. notebook fringes, bad handwriting, pen scribbles, doodles, wasted space, etc) will result in a deduction of points at my discretion. Submitted work that does not demonstrate clearly the process by which one arrived at the answer will not receive credit of any kind. Academic dishonesty will not be tolerated.

Name:

Broder

Score:

20/20

Problem Set II Solutions

Solution 1: Let $s(t) = -4.9t^2 + 20t + 30$, then
[3 pts]

$$a.) \frac{s(0.1) - s(0)}{0.1 - 0} = \frac{[-4.9(0.1)^2 + 20(0.1) + 30] - [30]}{0.1} = \frac{31.951 - 30}{0.1} = 19.51$$

$$b.) \frac{s(0.01) - s(0)}{0.01 - 0} = \frac{[-4.9(0.01)^2 + 20(0.01) + 30] - [30]}{0.01} = \frac{30.19951 - 30}{0.01} = 19.951$$

$$c.) \frac{s(0.001) - s(0)}{0.001 - 0} = \frac{[-4.9(0.001)^2 + 20(0.001) + 30] - [30]}{0.001} = \frac{30.0199951 - 30}{0.001} = 19.99951$$

↓
20

It seems as though the average velocities are approaching the value 20.

Solution 2: a.) $f(0) = \frac{e^{2(0)} - 2(0) - 1}{0^2} = \frac{1 - 0 - 1}{0} = \frac{0}{0} = \text{DNE}$
[3 pts]

Hence, 0 is not in the domain of $f(x)$.

b.)

x	f(x)
-0.1	1.873
-0.01	1.9867
-0.001	1.998667
↓	↓
0	2

x	f(x)
0.1	2.140
0.01	2.0134
0.001	2.00133
↓	↓
0 ⁺	2

From the Brute Force method, we conclude

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

Problem Set II Solutions

(2)

Solution 3:
[5 pts]

$$a.) \lim_{x \rightarrow -2} (x^2 + 5x + 7) = (-2)^2 + 5(-2) + 7 = 4 - 10 + 7 = \boxed{1}$$

$$b.) \lim_{x \rightarrow 48} (3x - 16)^{3/4} = (3(48) - 16)^{3/4} = (144 - 16)^{3/4} = 128^{3/4} = \boxed{8}$$

$$c.) \lim_{x \rightarrow 3} \frac{x^2 - 2x - 3}{x - 3} = \lim_{x \rightarrow 3} \frac{(x-3)(x+1)}{x-3} = 3+1 = \boxed{4}$$

$$d.) \lim_{x \rightarrow 1} \frac{x-1}{\sqrt{4x}-4} = \frac{1-1}{\sqrt{4(1)}-4} = \frac{0}{2-4} = \frac{0}{-2} = \boxed{0}$$

$$\begin{aligned} e.) \lim_{x \rightarrow 1} \frac{x-1}{\sqrt{4x}-2} &= \lim_{x \rightarrow 1} \frac{x-1}{\sqrt{4x}-2} \left(\frac{\sqrt{4x}+2}{\sqrt{4x}+2} \right) \\ &= \lim_{x \rightarrow 1} \frac{(x-1)(\sqrt{4x}+2)}{4x-4} \\ &= \lim_{x \rightarrow 1} \frac{(x-1)(\sqrt{4x}+2)}{4(x-1)} \\ &= \frac{\sqrt{4(1)}+2}{4} \\ &= \boxed{1} \end{aligned}$$

Solution 4:
[3 pts]

$$a.) \lim_{x \rightarrow 3^+} \frac{1}{x-3} = \frac{1}{0^+} = \boxed{\infty}$$

$$b.) \lim_{x \rightarrow 3^-} \frac{1}{x-3} = \frac{1}{0^-} = \boxed{-\infty}$$

$$c.) \lim_{x \rightarrow 3} \frac{1}{x-3} = \boxed{\text{DNE}}$$

Problem Set #7 Solutions

(3)

Solution 5:
[3 pts]

$$a) \lim_{x \rightarrow 1^+} \frac{x+2}{(1-x)^3} = \frac{3}{0^-} = \boxed{-\infty}$$

$$b) \lim_{x \rightarrow 1^-} \frac{x+2}{(1-x)^3} = \frac{3}{0^+} = \boxed{\infty}$$

$$c) \lim_{x \rightarrow 1} \frac{x+2}{(1-x)^3} = \boxed{\text{DNE}}$$

Solution 6:
[3 pts]

$$a) \lim_{x \rightarrow 2^+} \frac{x^2-4x+3}{(x-2)^2} = \lim_{x \rightarrow 2^+} \frac{(x-3)(x-1)}{(x-2)^2} = \frac{(-1)(1)}{0^+} = \boxed{-\infty}$$

$$b) \lim_{x \rightarrow 2^-} \frac{x^2-4x+3}{(x-2)^2} = \lim_{x \rightarrow 2^-} \frac{(x-3)(x-1)}{(x-2)^2} = \frac{(-1)(1)}{0^+} = \boxed{-\infty}$$

$$c) \lim_{x \rightarrow 2} \frac{x^2-4x+3}{(x-2)^2} = \boxed{-\infty}$$