

Assignment #5

Name Answer Key

Due 19 October 2009

1. The graph of a function f is pictured below. Answer the following questions.

- (a) Find and classify the discontinuities of f . At each of the discontinuities, state whether f is nonetheless right continuous or left continuous.

$x=0$; left cont.

$x=2$; left cont.

$x=4$; neither left nor right, vert. asym.

- (b) Is f continuous on $[-2, 0]$? Explain.

Yes. It is cont. on $(-2, 0)$ and right cont. @ -2 and left cont. @ 0 .

- (c) Is f continuous on $[0, 2]$? Explain.

No. f is not right cont. @ $x=0$.

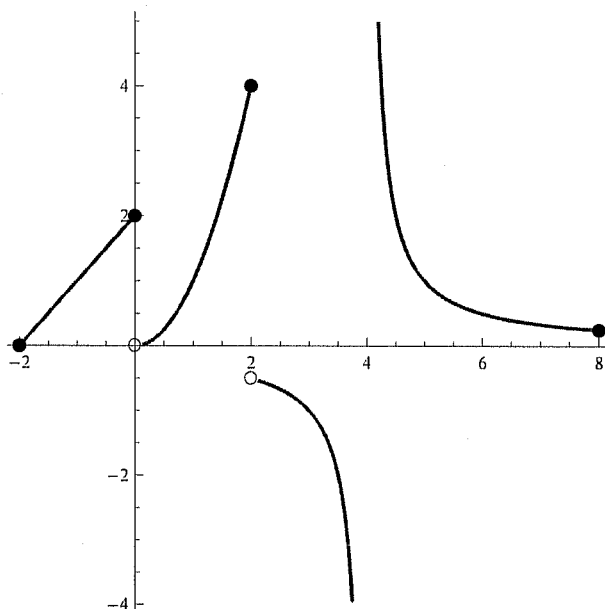
- (d) Is f continuous on $(2, 5)$? Explain.

No. There is a discontinuity @ $x=4$.

- (e) Is f continuous on $(4, 8]$? Explain.

Yes. f is cont. on $(4, 8)$ and left continuous @ $x=8$.

Figure 1: The graph of f



2. Let

$$f(x) = \begin{cases} \frac{x^2 + x - 2}{|x - 1|} & \text{if } x \neq 1 \\ -3 & \text{if } x = 1 \end{cases}$$

Determine whether or not f is continuous at $x = 1$. If f is discontinuous there, determine whether it is nonetheless right or left continuous.

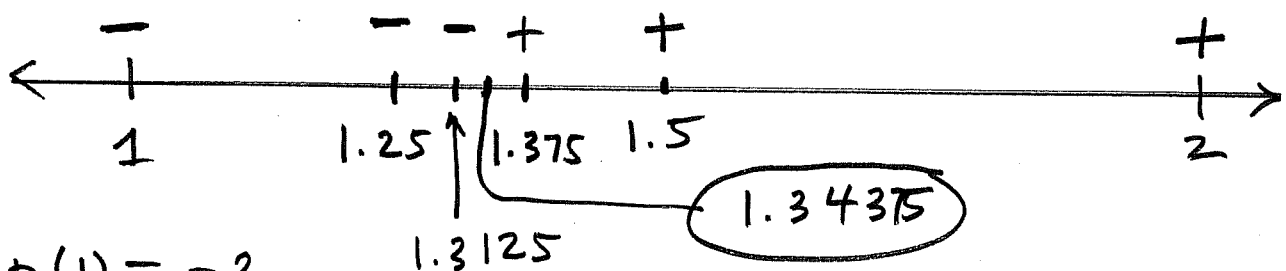
$$f(x) = \begin{cases} \frac{x^2 + x - 2}{x - 1} & \text{if } x > 1 \\ -3 & \text{if } x = 1 \\ \frac{x^2 + x - 2}{-(x - 1)} & \text{if } x < 1 \end{cases} = \begin{cases} x + 2 & \text{if } x > 1 \\ -3 & \text{if } x = 1 \\ -(x + 2) & \text{if } x < 1 \end{cases}$$

Thus $\lim_{x \rightarrow 1^+} f(x) = \lim_{x \rightarrow 1^+} (x + 2) = 3$ and

$$\lim_{x \rightarrow 1^-} f(x) = \lim_{x \rightarrow 1^-} -(x + 2) = -3.$$

Therefore f is not cont. @ $x = 1$. Since $f(1) = \lim_{x \rightarrow 1^-} f(x)$, f is left cont. @ $x = 1$.

3. Use the method of bisection to estimate the root of the equation $x^3 + 2x - 5 = 0$ to within .04.



$$p(1) = -2$$

$$p(2) = 7$$

$$p(1.5) = 1.375$$

$$p(1.25) = -.5468$$

$$p(1.375) = .349$$

$$p(1.3125) = -.114$$

guess : 1.34375

error $\leq .03125$