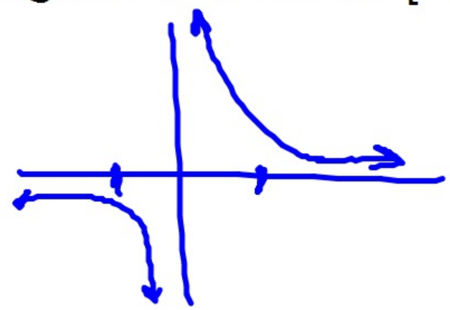
Journal: 9/11/15

Stephen says he can disprove the Intermediate Value Theorem. For $f(x) = 1/x$, he is looking for a root in [-1,1].

$f(-1) = -1$

$f(1) = 1$



Since $f(-1) \leq 0 \leq f(1)$, the IVT guarantees the existence of c, $-1 \leq c \leq 1$ such that $f(c) = 0$.

But he says there is no such c...[mic drop]

Has he made a mistake? Explain.

Homework: p. 80

67: $(x-1)^2$ is everywhere continuous

68. everywhere continuous

77. everywhere continuous $\quad \dfrac{x+1}{\sqrt{x}}$

78. Continuous on $(0, \infty)$ $\quad x > 0$

88.

$f(x) = x^3 + 5x - 3$

f(x) is cont on [0,1] so IVT applies. ✓

f(0) = -3 $\qquad$ f(1) = 3

so by the IVT, $\exists$ c $\in$ [0,1] s.t. f(c) = 0

because $-3 \leq 0 \leq 3$

"there exists" $\quad$ element of $\quad$ such that

$$\begin{array}{r|rrrr} 2 & 1 & -1 & 1 & -6 \\ & \downarrow & 2 & 2 & 6 \\ \hline & 1 & 1 & 3, & 0 \end{array}$$

$(x-2)\,\underbrace{(x^2+x+3)}$

89. $f(x) = x^2 - 2 - \cos(x)$

$\pi^2 - 2 - -1$

f(x) is cont on $[0,\pi]$ so IVT applies.

f(0) = -3 $\qquad$ $f(\pi) = \pi^2 - 1 \approx 8.87$

so by the IVT, $\exists$ c $\in$ $[0,\pi]$ s.t. f(c) = 0

because $-3 \leq 0 \leq 8.87$

97. f(x) is continuous, so IVT applies.

$f = x^3 - x^2 + x - 2$

f(0) = -2 $\qquad [0,3]$

f(3) = 19

$f(c) = 4$?

since 4 is in [-2,19], IVT guarantees c in [0,3] such that f(c) = 4.

solve $\qquad x = \dfrac{\pm1, \pm2, \pm3, \pm6}{\pm1}$

$x^3 - x^2 + x - 2 = 4$

$x^3 - x^2 + x - 6 = 0$ $\quad$ long division/rule of signs

$(x-2)(\cancel{x}\,x^2 + x + 3) = 0$

x = 2 is a root.

f(2) = 4

98. f(x) is continuous on [2.5, 4] (note discontinuity at 1, which is not included)

$f(2.5) = 35/6 \approx 5.833$

$f(4) = 20/3 \approx 6.667$ 😈

$$f(x) = \frac{x^2+x}{x-1}$$

6 is in [5.833,6.667] so IVT says there exists some c in [2.5,4] so that f(c) = 6.

solve

$$\left(\frac{x^2+x}{\cancel{x-1}} = 6\right) x-1$$

$$x^2+x = 6x-6$$

$$x^2-5x+6=0$$

$$(x-3)(x-2)=0$$

$$\underline{x=3}, \quad \underline{x=2}$$

c = 3

112. $V(r) = \underline{4/3 \ * \pi * r^3}$

$V(5cm) \approx 523.599 \text{ cm}^3$
$V(8cm) \approx 2144.661 \text{ cm}^3$

$V(r)$ is continuous for all r, so IVT applies.

Since $1500 \in [523.599, 2144.661]$, IVT guarantees there exists at least one $c \in [5,8]$ s.t. $f(c) = 1500$.

p. 93

Group Work on Limits and Continuity

Steps

1: #1

2: 2

3: #3

5: #4

6: #5

1. Work on Problem as a group
2. Make a draft
3. Copy onto Poster Paper to demonstrate answer/method.
4. Gallery Walk.