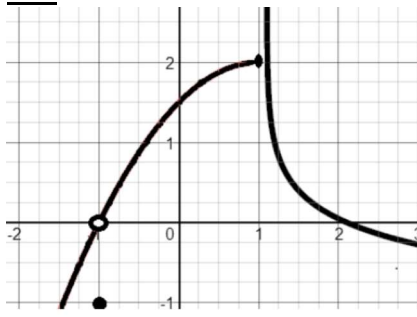
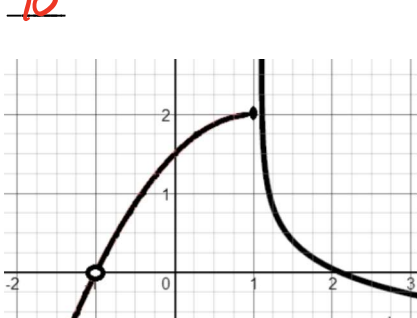
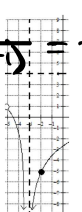


Enrichment: Topic 1.9 – Connecting Multiple Representations of Limits

Begin in the first cell marked #1 and find the requested information. To advance in the circuit, search for your answer and mark that cell #2. Continue in this manner until you complete the circuit. Show all pertinent work and be sure to write your limit statements throughout your solutions.

<p>#1</p> 	<p>Ans: ∞</p> <p>Find $f(-1)$.</p> <p>$= -1$</p>	<p>7</p> <p>Ans: 0</p> <p>Evaluate $\lim_{x \rightarrow 0} \frac{1}{2+x} - \frac{1}{x}$</p> <p>$= \lim_{x \rightarrow 0} \frac{2 - (x+2)}{2x(x+2)} = \lim_{x \rightarrow 0} \frac{-x}{2x(x+2)}$</p> <p>$= \frac{-1}{2(0+2)}$</p> <p>$= -\frac{1}{4}$</p>
<p>11</p> <p>Ans: DNE (and not ∞ or $-\infty$)</p> <p>Given $f(x) = \frac{x^3 - 4x^2 + 3x - 12}{x^2 - 6x + 8}$</p> <p>$= \frac{x^2(x-4) + 3(x-4)}{(x-4)(x+2)} = \frac{(x-4)(x^2+3)}{(x-4)(x+2)}$</p> <p>Hole @ $x=4$</p> <p>$f(x)$ has a hole at $x = ?$</p>	<p>4 Calc</p> <p>Ans: 0.249</p> <p>Evaluate $\lim_{x \rightarrow 0} \frac{\sqrt{x+3} - \sqrt{3}}{x}$</p> <p>$= \lim_{x \rightarrow 0} \frac{(\sqrt{x+3})^2 - (\sqrt{3})^2}{x(\sqrt{x+3} + \sqrt{3})} = \lim_{x \rightarrow 0} \frac{x+3-3}{x(\sqrt{x+3} + \sqrt{3})}$</p> <p>$= \lim_{x \rightarrow 0} \frac{x}{x(\sqrt{x+3} + \sqrt{3})} = \frac{1}{\sqrt{0+3} + \sqrt{3}} = \frac{1}{2\sqrt{3}}$</p> <p>$\approx 0.289$</p>	<p>2</p> <p>Ans: -1</p> <p>Evaluate $\lim_{x \rightarrow 1} \frac{x^3 - 1}{x^2 + x - 2}$</p> <p>$= \lim_{x \rightarrow 1} \frac{(x-1)(x^2+x+1)}{(x+2)(x-1)}$</p> <p>$= \lim_{x \rightarrow 1} \frac{x^2+x+1}{x+2} = \frac{1^2+1+1}{1+2} = \frac{3}{3} = 1$</p>
<p>10</p>  <p>Ans: 3</p> <p>Find $\lim_{x \rightarrow 1} f(x)$.</p> <p>dne</p>	<p>15</p> <p>Ans: 2</p> <p>Evaluate $\lim_{x \rightarrow -1^-} \frac{x}{x^2 - 1}$</p> <p>$= \lim_{x \rightarrow -1^-} \frac{x}{(x-1)(x+1)} = -\infty$</p> <p>VA @ $x = -1$</p> <p>$\frac{x}{(x-1)(x+1)}$</p> <p>$\frac{-1.1}{(-1.1-1)(-1.1+1)} = -$</p> 	<p>13</p> <p>Ans: -2</p> <p>Evaluate $\lim_{\Delta x \rightarrow 0} \frac{(4 + \Delta x)^2 - 3(4 + \Delta x) - 4}{\Delta x}$</p> <p>$= \lim_{\Delta x \rightarrow 0} \frac{16 + 8\Delta x + \Delta x^2 - 12 - 3\Delta x - 4}{\Delta x}$</p> <p>$= \lim_{\Delta x \rightarrow 0} \frac{\Delta x(\Delta x + 5)}{\Delta x} = 0 + 5 = 5$</p>

8 Ans: $-\frac{1}{4}$

Given $f(x) = \frac{x^2 - 5x + 6}{x^2 + 2x - 15} = \frac{(x-3)(x-2)}{(x+5)(x-3)}$
Hole @ x=3
VA @ x=-5

$f(x)$ has a vertical asymptote at $x = ?$ $x = -5$

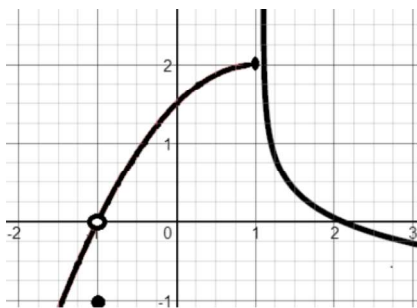
12 Ans: 4

Is $f(x) = \begin{cases} \cos x, & x < 0 \\ x^2 + 1, & x \geq 0 \end{cases}$ continuous at $x = 0$?

I. $f(0) = 1 \therefore f(0)$ is defined
 II. $\lim_{x \rightarrow 0^-} (\cos x) = 1 = \lim_{x \rightarrow 0^+} (x^2 + 1) \therefore \lim_{x \rightarrow 0} f(x)$ exists
 III. $f(0) = \lim_{x \rightarrow 0} f(x) = 1$

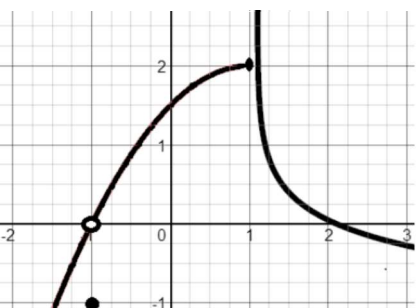
If yes, it is continuous, then go to Ans: -2
 If no, it is not continuous, then go to Ans: 5

16 Ans: $-\infty$



Find $\lim_{x \rightarrow 1^+} f(x)$.

14 Ans: 5



Find $f(1)$.

5 Ans: 0.289

Is $f(x) = \begin{cases} x, & x \leq 1 \\ 2x - 3, & x > 1 \end{cases}$ continuous at $x = 1$?

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

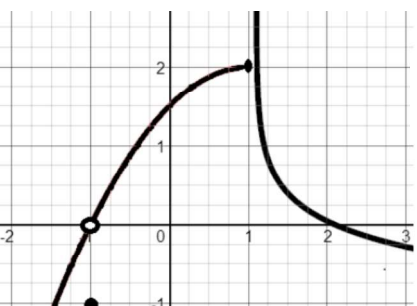
If yes, it is continuous, then go to Ans: 3
 If no, it is not continuous, then go to Ans: -4

9 Ans: -5

Given $f(x) = \frac{x^2 - 5x + 6}{x^2 + 2x - 15} = \frac{(x-3)(x-2)}{(x-3)(x+5)}$
Hole @ x=3

$f(x)$ has a removable discontinuity at $x = ?$ $x = 3$

6 Ans: -4



Find $\lim_{x \rightarrow -1} f(x)$.

= 0

3 Calc Ans: 1

x	1.9	1.99	1.999	2	2.001	2.01	2.1
f(x)	A	B	C	-	D	E	F

$\lim_{x \rightarrow 2} \frac{x-2}{x^2-4}$ If the table above were completed, what would take the place of E? (Round to three places.)

$\frac{x-2}{(x-2)(x+2)} = \frac{1}{x+2} @ x=2.01 \Rightarrow \frac{1}{2.01+2} = \frac{1}{4.01} \approx 0.249$