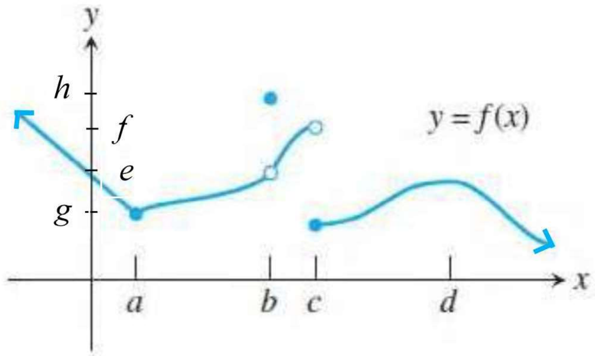
State the domain and any asymptotes of the following function. Answer each question.

1.)



Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

End Behavior:
As $x \to -\infty$, $f(x) \to \infty$. As $x \to \infty$, $f(x) \to -\infty$

$\lim_{x \to -\infty} f(x) = \infty$ $\lim_{x \to \infty} f(x) = -\infty$

Is the function continuous? Why or why not? no, the function has a hole and a jump

Where is it not continuous? hole $(x=b)$; jump $(x=c)$

$f(b) =$ h

$\lim_{x \to b^+} f(x) =$ e (approach b from the right)

$\lim_{x \to b^-} f(x) =$ e (approach b from the left)

$\lim_{x \to b} f(x) =$ e

$\lim_{x \to -\infty} f(x) =$ $-\infty$

$\lim_{x \to a} f(x) =$ g

$\lim_{x \to c^+} f(x) =$ g

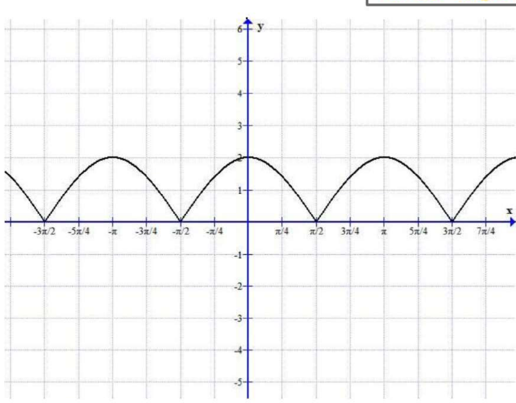
$\lim_{x \to c^-} f(x) =$ f

What conclusion can you draw about continuity? $f(c)$ is defined, $\lim_{x \to c} f(x)$ exists and $\lim_{x \to c} f(x) = f(c)$

Identify any vertical asymptotes, horizontal asymptotes, slant asymptotes, holes, *x*-intercepts and *y*-intercepts. Then graph the function. Describe the end behavior of the function as $x \to \infty$ and $x \to -\infty$.

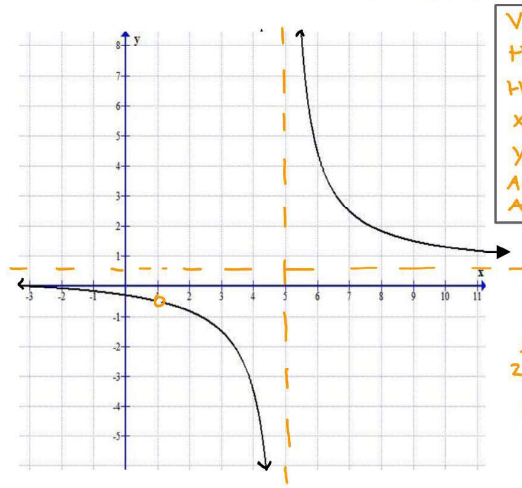
2.) $f(x) = \left| 2\sin\left(x - \frac{\pi}{2}\right) \right|$

V.A. none
H.A. none
X-int: $x = \frac{\pi}{2} + \pi n, n \in \mathbb{Z}$
y-int: $(0, 2)$
Holes: none
E.B.: oscillates



3.) $f(x) = \dfrac{x^2 + 2x - 3}{2x^2 - 12x + 10} = \dfrac{(x+3)(x-1)}{2(x-5)(x-1)} = \dfrac{x+3}{2(x-5)}$

V.A. $x = 5$
H.A. $y = \frac{1}{2}$
Holes: $(1, -\frac{1}{2})$
x-int: $(-3, 0)$
y-int: $(0, -\frac{3}{10})$
As $x \to -\infty$, $f(x) \to$
As $x \to \infty$, $f(x) \to$



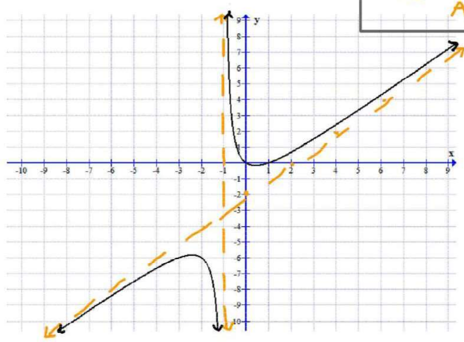
$\frac{x+3}{2(x-5)} = \frac{1}{2}$

$2x + 6 = 2x - 10$

$6 \neq -10$

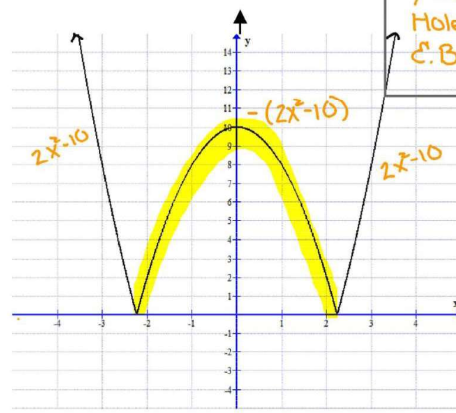
4.) $f(x)=\dfrac{x^2-x}{x+1}=\dfrac{x(x-1)}{x+1}$

O.A.: $y=x-2$
x-int: $(0,0)$ $(1,0)$
y-int: $(0,0)$
Holes: none
E.B.: As $x\to\infty, f(x)\to\infty$
As $x\to-\infty, f(x)\to-\infty$



5.) $f(x)=|2x^2-10|$

x-int: $(\pm\sqrt{5},0)$
y-int: $(0,10)$
Holes: none
E.B.: As $x\to\infty, f(x)\to$
As $x\to-\infty, f(x)$



6.) What connection, if any, do you see between the end behavior of the function and the horizontal asymptote(s)? The end behavior of a function appears to be the value of the horizontal asymptote. The end behavior approaches infinity or negative infinity when there is

Simplify each function. Then find the domain and equations of any asymptotes.

7. $f(x)=\dfrac{\left(1+\frac{1}{x}\right)x}{\left(1-\frac{1}{x}\right)x}=\dfrac{x+1}{x-1},\ x\neq 0$

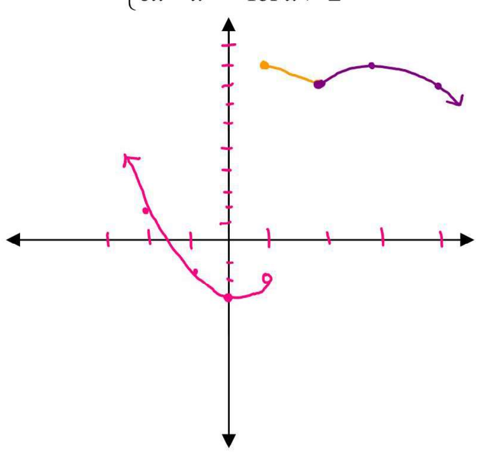
$\boxed{\begin{array}{l}D: (-\infty,0)\cup(0,1)\cup(1,\infty)\\ VA: x=1,\ HA: y=1\quad \text{hole}: (0,-1)\end{array}}$

8. $g(x)=\dfrac{\left(\frac{1}{x}+\frac{1}{2x+1}\right)x(2x+1)}{\left(\frac{4x}{2x+1}\right)x(2x+1)}=\dfrac{2x+1+x}{4x^2}=\dfrac{3x+1}{4x^2}$, $x\neq-\frac{1}{2}$

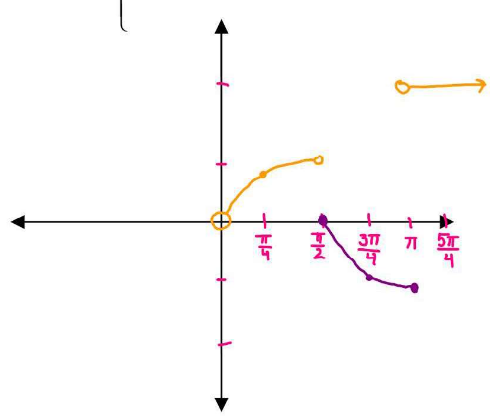
$\boxed{\begin{array}{l}D: (-\infty,-\frac{1}{2})\cup(-\frac{1}{2},0)\cup(0,\infty)\\ VA: x=0,\ HA: y=0,\ \text{hole}: (-\frac{1}{2},-\frac{1}{2})\end{array}}$

Graph the following functions for #9 & 10. Create and label an appropriate scale.

9.) $f(x)=\begin{cases}x^2-3 & \text{for } x<1\\ 10-x & \text{for } 1\le x\le 2\\ 6x-x^2 & \text{for } x>2\end{cases}$



10.) $f(\theta)=\begin{cases}\sin\theta & \text{for } 0<\theta<\frac{\pi}{2}\\ \cos\theta & \text{for } \frac{\pi}{2}\le\theta\le\pi\\ 2 & \text{for } \theta>\pi\end{cases}$



For #11 & 12, rationalize the following functions.

11.) $f(x)=\dfrac{x}{\sqrt{x}+1}\cdot\dfrac{\sqrt{x}-1}{\sqrt{x}-1}=\dfrac{x(\sqrt{x}-1)}{x+\sqrt{x}-\sqrt{x}-1}=\boxed{\dfrac{x(\sqrt{x}-1)}{x-1}}$

12.) $f(x)=\dfrac{3\sqrt{3}}{2-\sqrt{3}}\cdot\dfrac{2+\sqrt{3}}{2+\sqrt{3}}=\dfrac{6\sqrt{3}+3\sqrt{9}}{4-3}$ $\boxed{=6\sqrt{3}+9}$