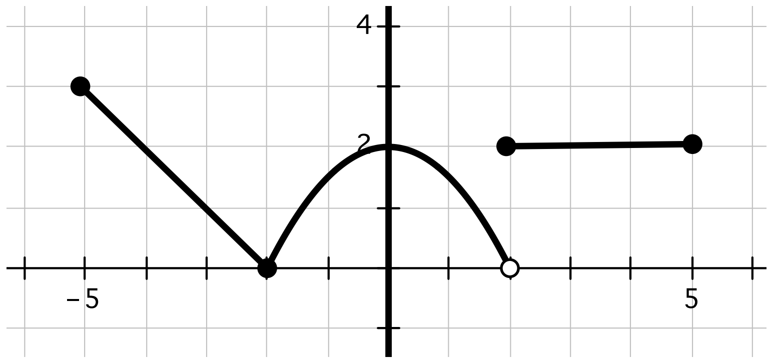
Honors PreCalculus '22-23 Name:_____________________

Piece-Wise Defined Functions Test

Dr. Quattrin score______

Calculator allowed




1. The graph of the function *f* is shown in the figure above. For how many values of *x* in the open interval $(-5,\ 5)$ is *f* not differentiable?

a) One b) Two c) Three d) Four e) Five

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2. Let $f$ be defined by $f(x)=\begin{cases} x^2-kx & \text{for } x<4 \\ 4\sin\left(\frac{\pi}{2}x\right) & \text{for } x\geq 4 \end{cases}$. Determine the value of $k$ for which is continuous for all real $x$.

a) $-6$ b) $-2$ c) -4 d) 4 e) -3

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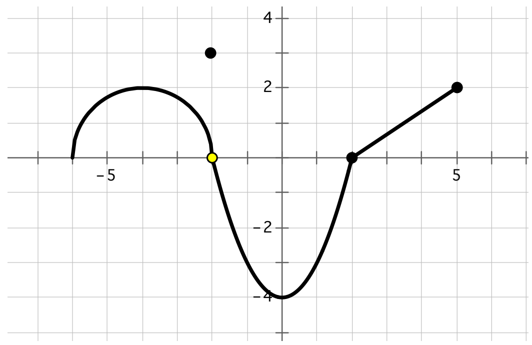
3. The function $f$ is shown below. Which of the following statements about the function $f$, shown below, is **false**?




a) $\lim_{x \to 0} f(x)$ does not exist

b) $\lim_{x \to 2} f(x)$ exists

c) $f$ is discontinuous at $x = -2$

d) $\lim_{h \to 0} \frac{f(1-h)+3}{h}$ exists

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4. The function $f$ defined on all the Reals such that $f(x) = \begin{cases} 2 - mx, \text{if } x \le 3 \\ k\sqrt{x^2+7}, \text{if } x > 3 \end{cases}$

. For which of the following values of $k$ and $m$ will the function $f$ be both continuous and differentiable on its entire domain?

a) $m = \frac{6}{7},\ k = \frac{8}{7}$

b) $m = -\frac{6}{7},\ k = \frac{8}{7}$

c) $m = \frac{6}{7},\ k = -\frac{8}{7}$

d) $m = -\frac{6}{7},\ k = -\frac{8}{7}$

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5. A function $f(x)$ has a vertical asymptote at $x = 2$. The derivative of $f(x)$ is negative for all $x \neq 2$. Which of the following statements are **false**?

I. $\lim_{x \to 2} f(x) = +\infty$ II. $\lim_{x \to 2^-} f(x) = -\infty$ III. $\lim_{x \to 2^+} f(x) = +\infty$

(a) I only (b) II only (c) III only

(d) I and II only (e) I, II and III

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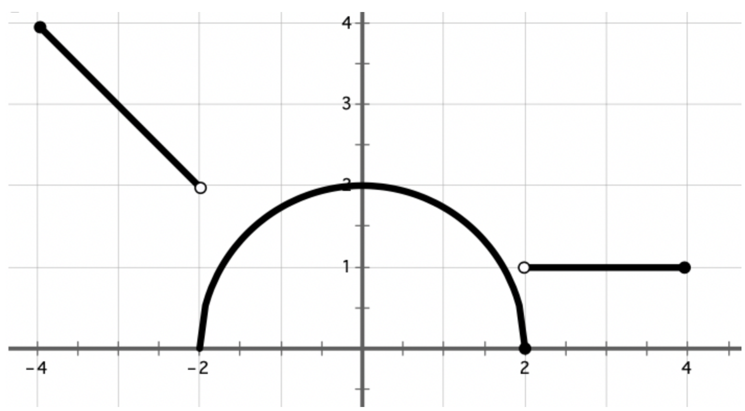
6. Given this graph of $f(x)$, which of the following might be the equation?




a) $f(x) = \begin{cases} -x, \ if \ -4 \le x < -2 \\ \sqrt{4 - x^2}, \ if \ -2 \le x \le 2 \\ 1, \ if \ 2 < x \le 4 \end{cases}$

b) $f(x) = \begin{cases} -x - 2, \ if \ -4 \le x < -2 \\ 2 - \frac{1}{2}x^2, \ if \ -2 \le x \le 2 \\ 1, \ if \ 2 < x \le 4 \end{cases}$

c) $f(x) = \begin{cases} x + 2, \ if \ -4 \le x < -2 \\ \sqrt{4 - x^2}, \ if \ -2 \le x \le 2 \\ 1, \ if \ 2 \le x \le 4 \end{cases}$

d) $f(x) = \begin{cases} -x - 2, \ if \ -4 \le x < -2 \\ 2 - \frac{1}{2}x^2, \ if \ -2 \le x < 2 \\ 1, \ if \ 2 \le x \le 4 \end{cases}$

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7. At $x=0$, the function given by $f(x)=\begin{cases} x^2+1, & if \;\; x\le 0 \\ -\sqrt{4x-x^2}, & if \;\; 0<x \end{cases}$ is

a) Undefined

b) Continuous but not differentiable

c) Differentiable but not continuous

d) Neither continuous nor differentiable

e) Both continuous and differentiable

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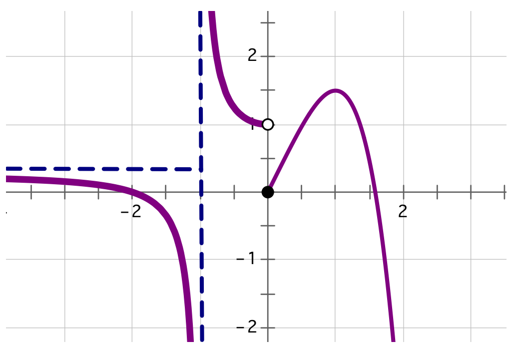


8. Given the graph of $f(x)$ above, the reason $x=0$ is a critical value is because

a) $f(x)$ is not continuous at $x=0$

b) $f\,'(x)=0$ at $x=0$

c) $f\,'(x)$ does not exist at $x=0$

d) $x=0$ is an endpoint of the domain restriction

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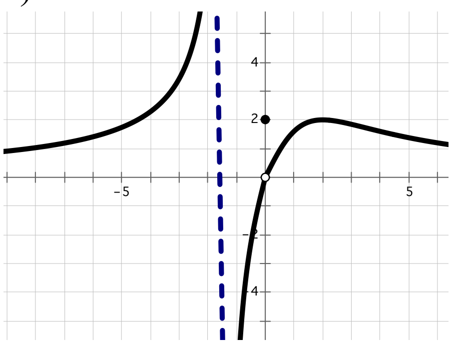
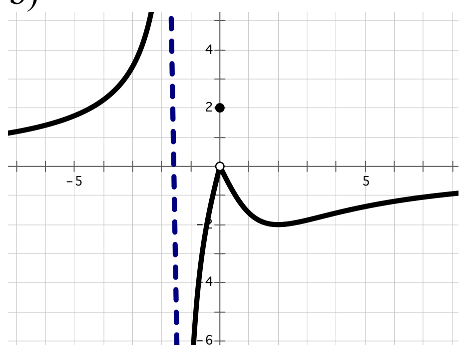
9. Which of the following is the graph of $f(x) = \begin{cases} \dfrac{8x}{4+x^2}, \text{ if } 0 < x \\ 2, \textit{ if } x = 0 \\ \dfrac{-8x}{x^2-2}, \text{ if } x < 0 \end{cases}$ ?

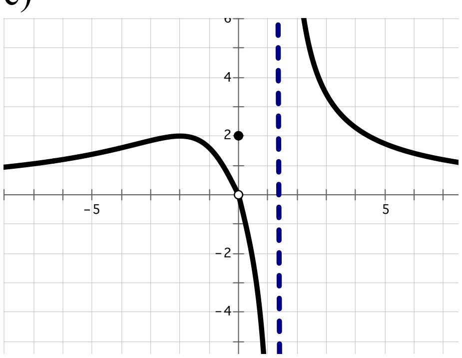
a)



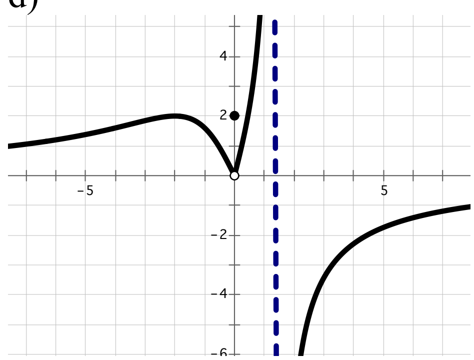

b)




c)




d)



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Calculator allowed

1. $$f(x)=\begin{cases} \dfrac{1}{x+2}, \text{if} x<-2 \\ 3, \text{if} x=-2 \\ 4-x^2, \text{if} -2<x<2 \\ \dfrac{x-2}{x-1}, \quad \text{if } 2\le x \end{cases}$$

i) Is $f(x)$ continuous at $x=-2$? Why or why not?

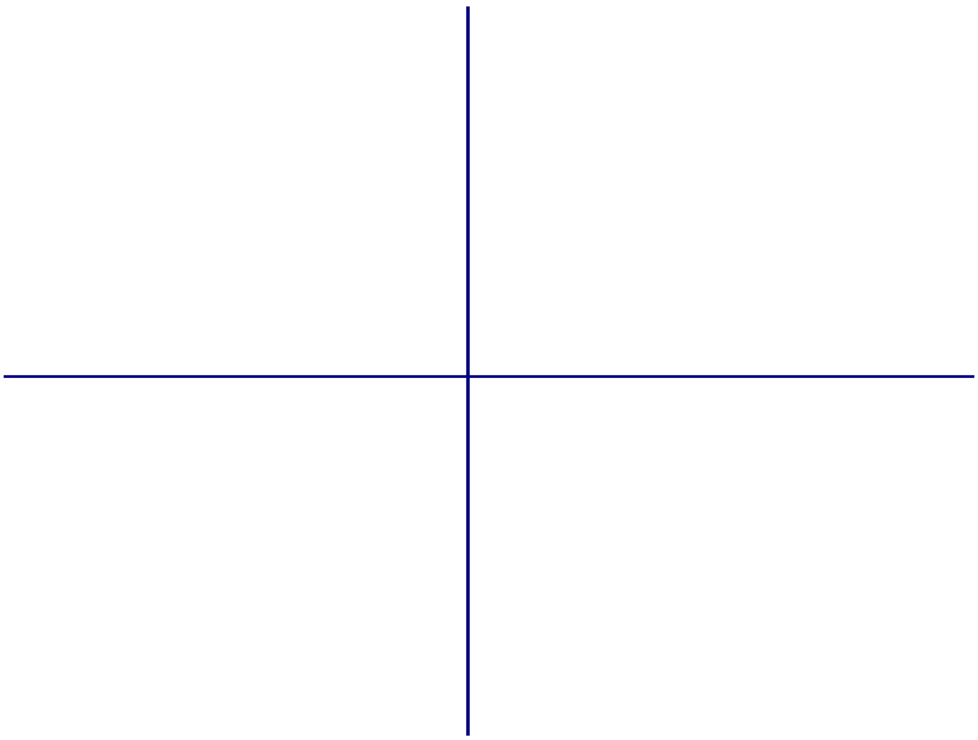
ii) Is it differentiable at $x=-2$? Why or why not?

2. $f(x)=\begin{cases} \dfrac{1}{x+2}, \text{if} x < -2 \\ 3, \text{if} x = -2 \\ 4-x^2, \text{if} -2 < x < 2 \\ \dfrac{x-2}{x-1}, \quad \text{if } 2 \le x \end{cases}$

i) Is $f(x)$ continuous at $x = 2$? Why or why not?

ii) Is it differentiable at $x = 2$? Why or why not?

3. Sketch $f(x) = \begin{cases} \dfrac{1}{x+2}, \text{if } x < -2 \\ 3, \text{if } x = -2 \\ 4 - x^2, \text{if } -2 < x < 2 \\ \dfrac{x-2}{x-1}, \quad \text{if } 2 \le x \end{cases}$. State the Traits listed.



Domain: Range:

Zeros: Y-int:

VAs:

EB (Left): EB (Right):

*x*-values of discontinuities:

$x$-values of non-differentiability:

Extreme Points (provide non-graphical evidence):