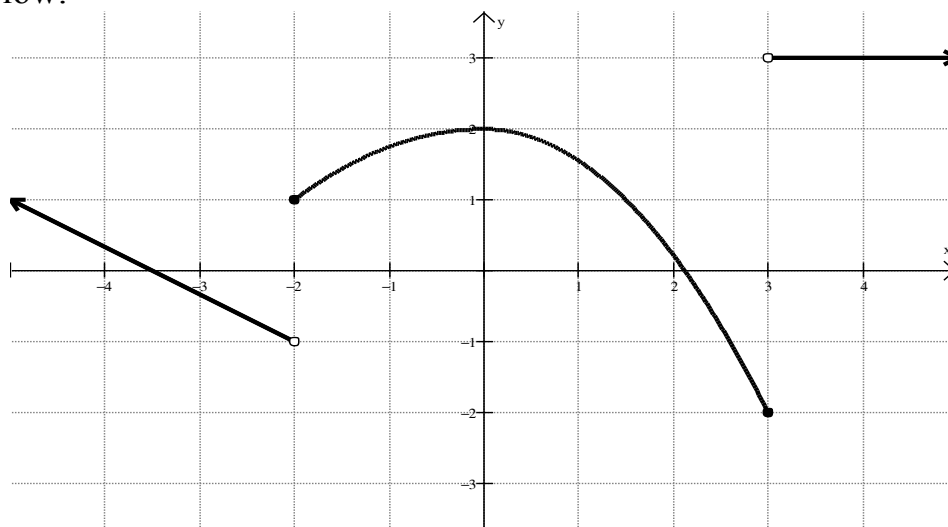


Honors PreCalculus '17-18  
Piece-Wise Defined Functions Test  
Dr. Quattrin  
Calculator allowed

Name: \_\_\_\_\_

1. The function  $f$  is defined on the interval  $x \in (-4, 7)$  and has the graph shown below.



For which of the following statements are **false**?

- I.  $\lim_{x \rightarrow 5^+} f(x) = 4$ .
- II.  $f$  is differentiable at  $x = 0$ .
- III.  $f$  has a local minimum at  $x = 3$ .

- (a) I only
- (b) II only
- (c) III only
- (d) I and II only
- (e) I and III only

---

2. The end behavior of  $g(x) = \sqrt{\frac{x^3 - 9}{x^2 + 4}}$

- a)  $y = 0$  on both ends
- b) None on the left and up on the right
- c) Up on the left and none on the right
- d)  $y = 1$  on both ends
- e) None on the left and  $y = 0$  on the right

---

3. Let  $m$  and  $b$  be real numbers and let the function  $f$  be defined by

$$f(x) = \begin{cases} 3x^2 - mx + 5 & \text{for } x \leq 1 \\ mx + b & \text{for } x > 1 \end{cases}$$

If  $f$  is both continuous and differentiable at  $x = 1$ , then

- (a)  $m = 3, b = 2$
- (b)  $m = 3, b = -2$
- (c)  $m = -3, b = 2$
- (d)  $m = -3, b = -2$
- (e) None of these

---

4. Let  $f(x) = \begin{cases} -x+5, & \text{if } x < -2 \\ x^2+3, & \text{if } -2 \leq x \leq 1 \\ 2x^3, & \text{if } 1 < x \end{cases}$ . Which of the following statements is **true** about  $f$ ?

- I.  $f$  is continuous at  $x = -2$ .
- II.  $f$  is differentiable at  $x = 1$ .
- III.  $f$  has a local minimum at  $x = -2$ .

- (a) I only
  - (b) II only
  - (c) III only
  - (d) I and III only
  - (e) II and III only
-

5. If the derivative of the function  $f$  is  $f'(x) = -3(x+2)^4(x+1)(x-3)^3$ , then  $f$  has a local maximum at  $x =$

- (a) -2 only (b) -1 only (c) 3 only (d) -2 and 3 (e) -1 and 3
- 

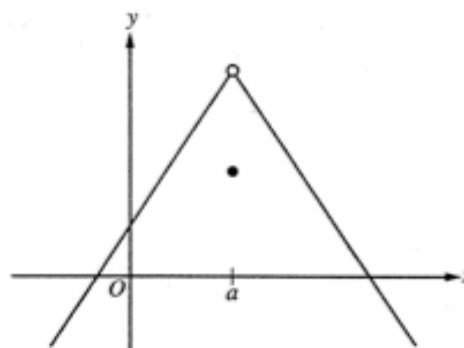
6. Let  $f$  be defined by  $f(x) = \begin{cases} x^2 + kx & \text{for } x < 4 \\ 4\cos\left(\frac{\pi}{2}x\right) & \text{for } x \geq 4 \end{cases}$ . Determine the value of  $k$

for which  $f$  is continuous for all real  $x$ .

- a) -6 (b) -2 (c) 8 (d) 14 (e) None of these
- 

7. The graph of the function  $f(x)$  is shown below. Which of the following statements **must** be false?

- a)  $f(a)$  does not exist.  
b)  $f(x)$  is defined for  $0 < x < a$   
c)  $f(x)$  is not continuous at  $x = a$ .  
d)  $\lim_{x \rightarrow a} f(x)$  exists.  
e)  $\lim_{x \rightarrow a} f'(x)$  does exist.



Graph of  $f$

---

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

- (a) I only      (b) II only      (c) III only  
(d) I and II only      (e) I, II and III
-

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Piece-Wise Defined Functions Test  
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Calculator allowed

Name: \_\_\_\_\_

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

i) Is  $f(x)$  continuous at  $x=0$ ? Why or why not?

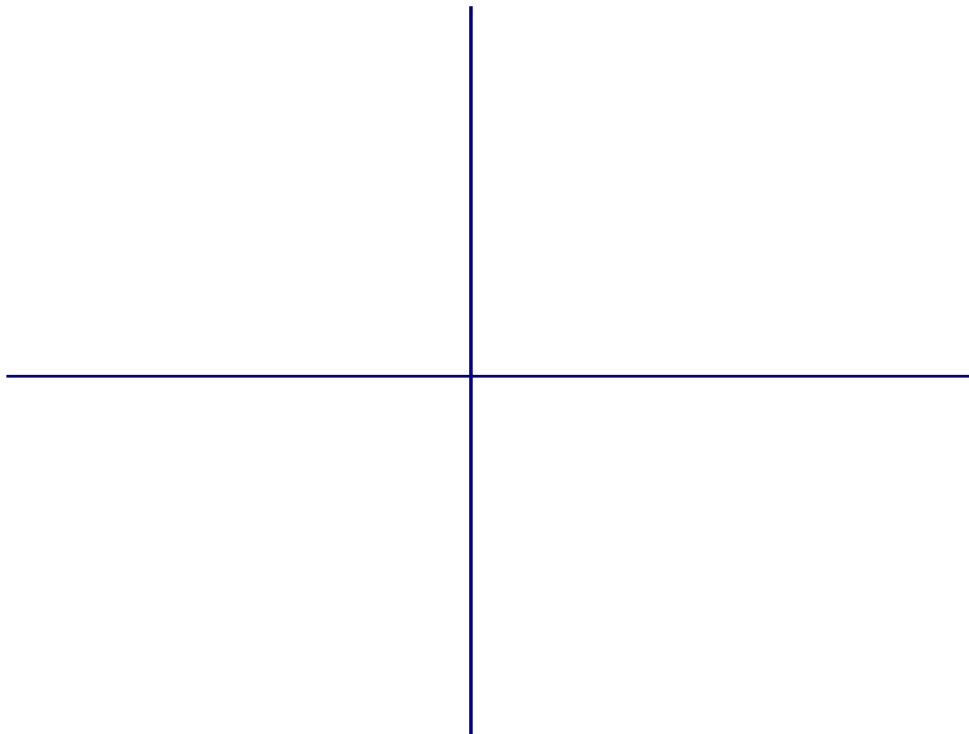
ii) Is  $f(x)$  differentiable at  $x=0$ ? Why or why not?

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

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

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

3. Sketch  $f(x) = \begin{cases} \frac{1}{x+2}, & \text{if } x < -2 \\ 3, & \text{if } x = -2 \\ 4-x^2, & \text{if } -2 < x < 2 \\ \frac{x-2}{x-1}, & \text{if } 2 \leq x \end{cases}$ . 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):

Honors PreCalculus '17-18  
Piece-Wise Defined Functions Test  
Page 2  
Calculator allowed

Name: \_\_\_\_\_

$$1. \quad h(x) = \begin{cases} 2-3x, & \text{if } x < -2 \\ 3, & \text{if } x = -2 \\ -\sqrt{4-x^2}, & \text{if } -2 < x < 0 \\ 5-x, & \text{if } 0 \leq x < 2 \\ 3x^2-9, & \text{if } x \geq 2 \end{cases}$$

i) Is  $h(x)$  continuous at  $x=0$ ? Why or why not?

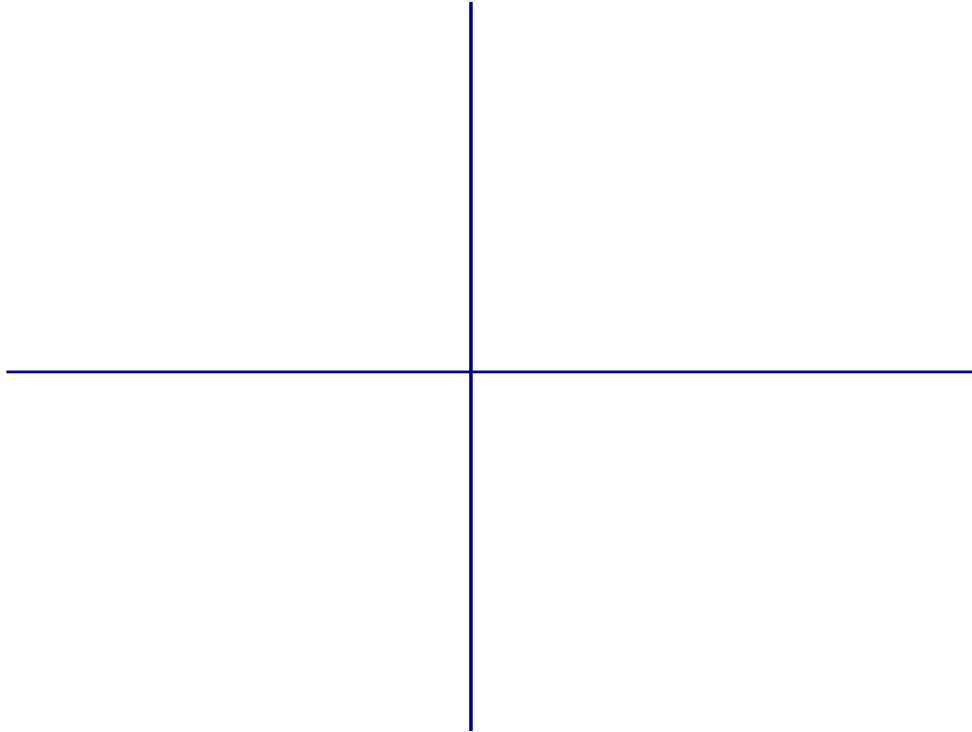
ii) Is it differentiable at  $x=0$ ? Why or why not?

$$2. h(x) = \begin{cases} 2-3x, & \text{if } x < -2 \\ 3, & \text{if } x = -2 \\ -\sqrt{4-x^2}, & \text{if } -2 < x < 0 \\ 5-x, & \text{if } 0 \leq x < 2 \\ 3x^2-9, & \text{if } x \geq 2 \end{cases}$$

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

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

3. Sketch  $h(x) = \begin{cases} 2-3x, & \text{if } x < -2 \\ 3, & \text{if } x = -2 \\ -\sqrt{4-x^2}, & \text{if } -2 < x < 0 \\ 5-x, & \text{if } 0 \leq x < 2 \\ 3x^2-9, & \text{if } x \geq 2 \end{cases}$ . 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):

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Piece-Wise Defined Functions Test  
Page 3  
Calculator allowed

Name: \_\_\_\_\_

$$1. \quad P(x) = \begin{cases} -2 - 2\sqrt{-x-2}, & \text{if } -6 \leq x \leq -2 \\ \frac{-5x}{x^2-9}, & \text{if } -2 < x < 2 \\ x, & \text{if } 2 \leq x \leq 6 \end{cases}$$

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

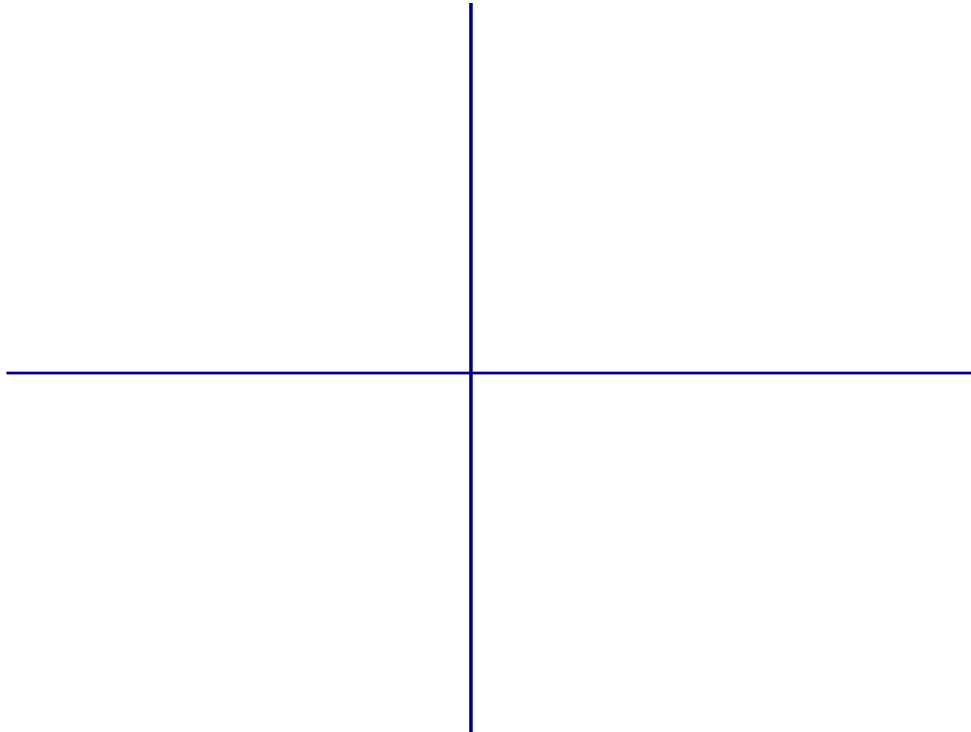
ii) Is  $P(x)$  differentiable at  $x = -2$ ? Why or why not?

$$2. \quad P(x) = \begin{cases} -2 - 2\sqrt{-x-2}, & \text{if } -6 \leq x \leq -2 \\ \frac{-5x}{x^2-9}, & \text{if } -2 < x < 2 \\ x, & \text{if } 2 \leq x \leq 6 \end{cases}$$

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

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

3. Sketch  $P(x) = \begin{cases} -2 - 2\sqrt{-x-2}, & \text{if } -6 \leq x \leq -2 \\ \frac{-5x}{x^2-9}, & \text{if } -2 < x < 2 \\ x, & \text{if } 2 \leq x \leq 6 \end{cases}$ . 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):

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Piece-Wise Defined Functions Test  
Page 4  
Calculator allowed

Name: \_\_\_\_\_

$$1. \quad g(x) = \begin{cases} \frac{-2}{x+1}, & \text{if } -5 \leq x \leq -2 \\ x, & \text{if } -2 < x < 0 \\ \frac{4x}{x^2+4}, & \text{if } 0 \leq x \leq 5 \end{cases}$$

i) Is  $g(x)$  continuous at  $x=0$ ? Why or why not?

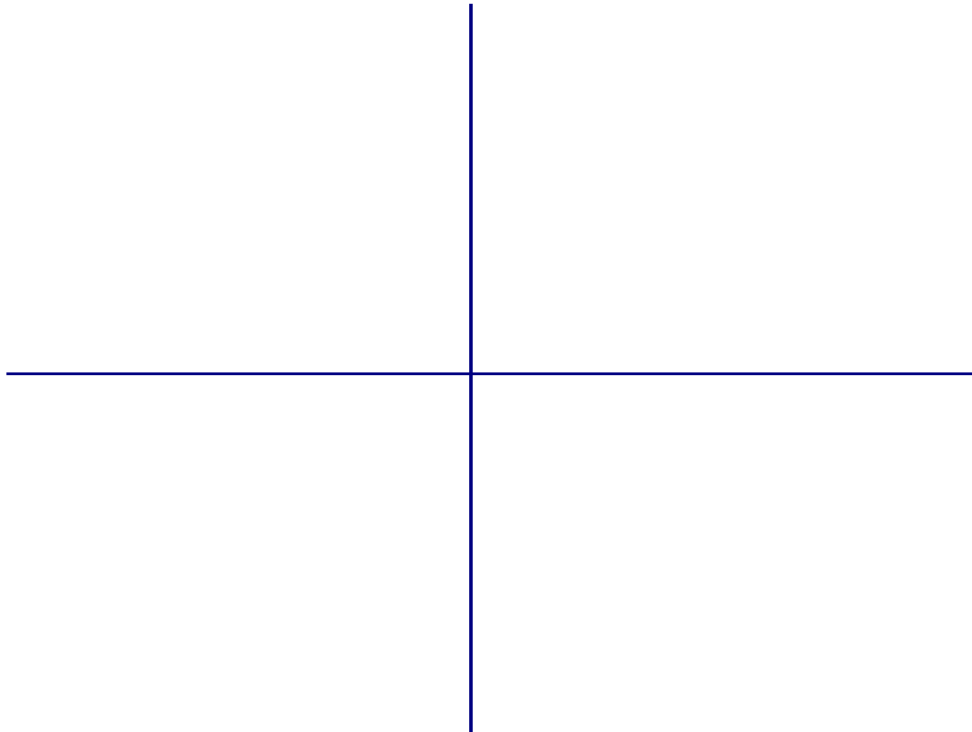
ii) Is  $g(x)$  differentiable at  $x=0$ ? Why or why not?

$$2. \quad g(x) = \begin{cases} \frac{-2}{x+1}, & \text{if } -5 \leq x \leq -2 \\ x, & \text{if } -2 < x < 0 \\ \frac{4x}{x^2+4}, & \text{if } 0 \leq x \leq 5 \end{cases}$$

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

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

3. Sketch  $g(x) = \begin{cases} \frac{-2}{x+1}, & \text{if } -5 \leq x \leq -2 \\ x, & \text{if } -2 < x < 0 \\ \frac{4x}{x^2+4}, & \text{if } 0 \leq x \leq 5 \end{cases}$ . State the Traits listed.



Domain:

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$x$ -values of discontinuities:

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Extreme Points (provide non-graphical evidence):