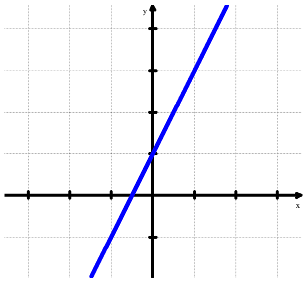
Calculus

Write your questions and thoughts here!

2.4 Differentiability and Continuity

Notes

A graph of a function is shown below. Write down its equation on line #1.



1. $y =$ ____________________
2. $y =$ ____________________
3. $y =$ ____________________

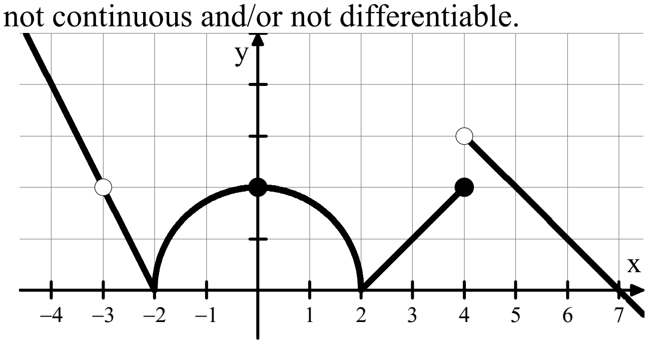
Differentiability:

The derivative exists for each point in the domain. The graph must be a smooth line or curve for the derivative to exist. In other words, the graph looks like a line if you zoom in.

The derivative ***fails to exist*** where the function has a

1.	2.	3.

Identify points where the function below is not continuous and/or not differentiable.



True or **False**	**True** or **False**
Differentiability implies continuity.	Continuity implies differentiability.

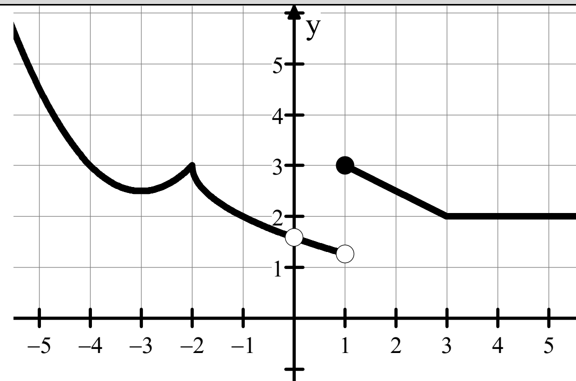
2.4 Differentiability and Continuity

Calculus

Practice

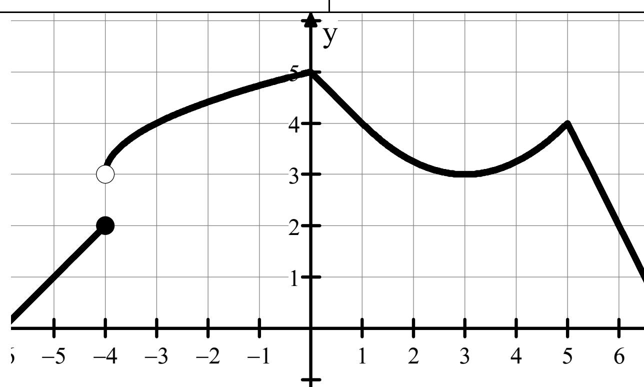
Identify any x-values of the function that are not continuous and/or not differentiable.

1.



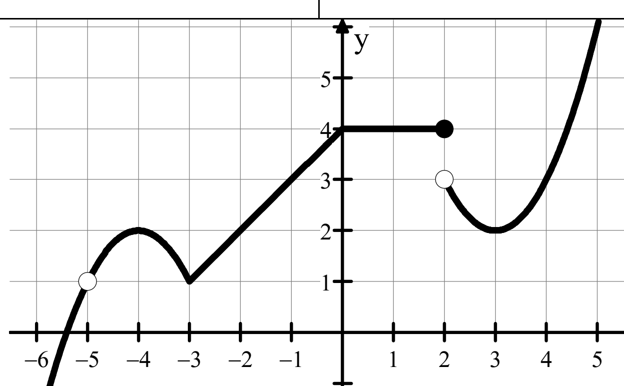
x-values where the function is not continuous.	x-values where the function is continuous, but not differentiable.

2.



x-values where the function is not continuous.	x-values where the function is continuous, but not differentiable.

3.



x-values where the function is not continuous.	x-values where the function is continuous, but not differentiable.

4. f is continuous for $a \leq x \leq b$ but not differentiable for some c such that $a < c < b$. Which of the following could be true?

(A) $x = c$ is a vertical asymptote of the graph of f.

(B) $\lim\limits_{x \to c} f(x) \neq f(c)$

(C) The graph of f has a cusp at $x = c$.

(D) $f(c)$ is undefined.

(E) None of the above

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5. If g is differentiable at $x = c$, which of the following must be true?

I. g is continuous at $x = c$.

II. $\lim\limits_{x \to c} g(x)$ exists.

III. $\lim\limits_{x \to c} \frac{g(x)-g(c)}{x-c}$ exists.

(A) I only

(B) II only

(C) III only

(D) I and II only

(E) I, II, and III

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6. Let h be the function given by $h(x) = |x - 4|$. Which of the following statements about h are true?

I. h is continuous at $x = 4$.

II. h is differentiable at $x = 4$.

III. h has an absolute minimum at $x = 4$.

(A) I only

(B) II only

(C) III only

(D) I and III only

(E) II and III only

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7. If f is a differentiable function such that $f(2) = 5$ and $f'(2) = 7$, which of the following statements could be false?

(A) $\lim\limits_{x \to 2} f(x) = 5$

(B) $\lim\limits_{x \to 2^-} f(x) = \lim\limits_{x \to 2^+} f(x)$

(C) $\lim\limits_{x \to 2} \frac{f(x)-5}{x-2} = 7$

(D) $\lim\limits_{h \to 0} \frac{f(2+h)-5}{h} = 7$

(E) $\lim\limits_{h \to 0} f'(x) = 7$