MATH 11012 | Intuitive Calculus | Spring 2011

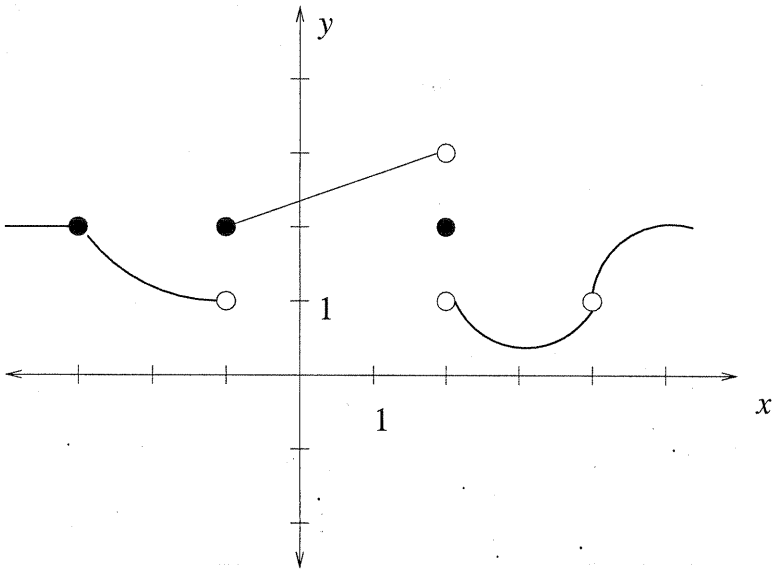
Circle one: 8:50 5:30 | Ms. Kracht

Name: KEY | Quiz Score: /25

Quiz 1: Version A

Show your reasoning. Use standard notation correctly.

1. (10 points) The function f is depicted below.



(a) Find each of the following or state "does not exist" ("dne").

$\lim_{x\to -3^-} f(x) =$ 2	$\lim_{x\to -1^-} f(x) =$ 1	$\lim_{x\to 2^-} f(x) =$ 3	$\lim_{x\to 4^-} f(x) =$ 1
$\lim_{x\to -3^+} f(x) =$ 2	$\lim_{x\to -1^+} f(x) =$ 2	$\lim_{x\to 2^+} f(x) =$ 1	$\lim_{x\to 4^+} f(x) =$ 1
$\lim_{x\to -3} f(x) =$ 2	$\lim_{x\to -1} f(x) =$ dne	$\lim_{x\to 2} f(x) =$ dne	$\lim_{x\to 4} f(x) =$ 1
$f(-3) =$ 2	$f(-1) =$ 2	$f(2) =$ 2	$f(4) =$ dne

(b) Circle YES or NO for each of the following.

i. Is f continuous at -3? (YES) NO

ii. Is f continuous at -1? YES (NO)

iii. Is f continuous at 2? YES (NO)

iv. Is f continuous at 4? YES (NO)

2. (5 points) Find the average rate of change of $f(x) = x^2 - 7x$ over the interval $[1, 3]$.

$$\frac{f(3)-f(1)}{3-1} = \frac{[3^2-7(3)]-[1^2-7\cdot 1]}{2}$$

$$= \frac{(9-21)-(1-7)}{2}$$

$$= \frac{-12-(-6)}{2} = \frac{-12+6}{2} = \frac{-6}{2} = -3$$

3. (10 points)

(a) State the definition of derivative.

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

(b) Find the derivative $f'(x)$ of the function $f(x) = 3x^2 - 10x + 5$ *using the definition of derivative.*

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

$$= \lim_{h\to 0} \frac{[3(x+h)^2-10(x+h)+5]-[3x^2-10x+5]}{h}$$

$$= \lim_{h\to 0} \frac{3(x^2+2hx+h^2)-10x-10h+5-3x^2+10x-5}{h}$$

$$= \lim_{h\to 0} \frac{3x^2+6hx+3h^2-10h-3x^2}{h}$$

$$= \lim_{h\to 0} \frac{6hx+3h^2-10h}{h}$$

$$= \lim_{h\to 0} \frac{h(6x+3h-10)}{h}$$

$$= \lim_{h\to 0} (6x+3h-10)$$

$$= 6x+3\cdot 0-10$$

$$= 6x-10.$$

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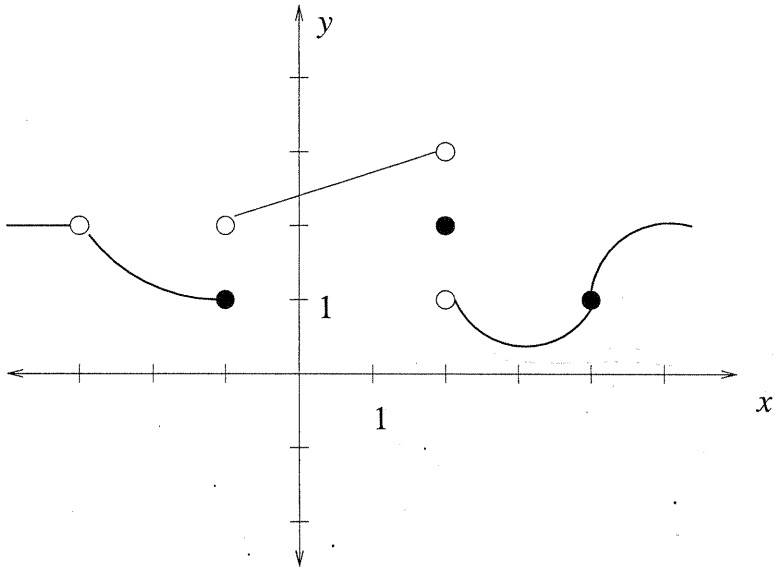
Quiz 1: Version B

Show your reasoning. Use standard notation correctly.

1. (10 points) The function f is depicted below.



(a) Find each of the following or state "does not exist" ("dne").

$\lim_{x\to -3^-} f(x) =$ 2	$\lim_{x\to -1^-} f(x) =$ 1	$\lim_{x\to 2^-} f(x) =$ 2	$\lim_{x\to 4^-} f(x) =$ 1
$\lim_{x\to -3^+} f(x) =$ 2	$\lim_{x\to -1^+} f(x) =$ 2	$\lim_{x\to 2^+} f(x) =$ 1	$\lim_{x\to 4^+} f(x) =$ 1
$\lim_{x\to -3} f(x) =$ 2	$\lim_{x\to -1} f(x) =$ dne	$\lim_{x\to 2} f(x) =$ dne	$\lim_{x\to 4} f(x) =$ 1
$f(-3) =$ dne	$f(-1) =$ 1	$f(2) =$ 2	$f(4) =$ 1

(b) Circle YES or NO for each of the following.

i. Is f continuous at -3? YES (NO)

ii. Is f continuous at -1? YES (NO)

iii. Is f continuous at 2? YES (NO)

iv. Is f continuous at 4? (YES) NO

2. (5 points) Find the average rate of change of $f(x) = x^2 - 5x$ over the interval $[1, 3]$.

$$\frac{f(3)-f(1)}{3-1} = \frac{(3^2-5\cdot 3)-(1^2-5\cdot 1)}{2}$$

$$= \frac{(9-15)-(1-5)}{2}$$

$$= \frac{-6-(-4)}{2} = \frac{-6+4}{2} = \frac{-2}{2} = -1.$$

3. (10 points)

(a) State the definition of derivative.

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

(b) Find the derivative $f'(x)$ of the function $f(x) = 2x^2 - 3x + 8$ *using the definition of derivative.*

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

$$= \lim_{h\to 0} \frac{[2(x+h)^2-3(x+h)+8]-[2x^2-3x+8]}{h}$$

$$= \lim_{h\to 0} \frac{2(x^2+2hx+h^2)-3x-3h+8-2x^2+3x-8}{h}$$

$$= \lim_{h\to 0} \frac{2x^2+4hx+2h^2-3h-2x^2}{h}$$

$$= \lim_{h\to 0} \frac{4hx+2h^2-3h}{h}$$

$$= \lim_{h\to 0} \frac{h(4x+2h-3)}{h}$$

$$= \lim_{h\to 0} (4x+2h-3)$$

$$= 4x + 2\cdot 0 - 3$$

$$= 4x - 3.$$

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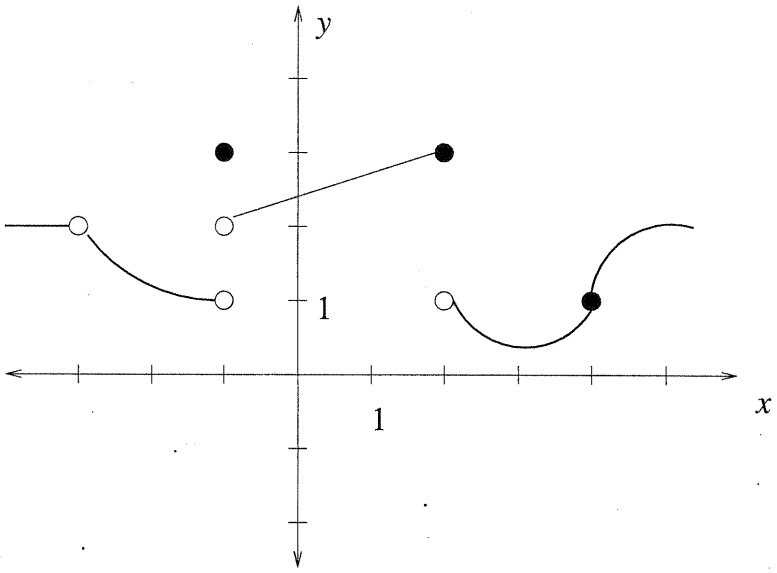
Quiz 1: Version C

Show your reasoning. Use standard notation correctly.

1. (10 points) The function f is depicted below.



(a) Find each of the following or state "does not exist" ("dne").

$\lim_{x\to -3^-} f(x) =$ 2	$\lim_{x\to -1^-} f(x) =$ 1	$\lim_{x\to 2^-} f(x) =$ 3	$\lim_{x\to 4^-} f(x) =$ 1
$\lim_{x\to -3^+} f(x) =$ 2	$\lim_{x\to -1^+} f(x) =$ 2	$\lim_{x\to 2^+} f(x) =$ 1	$\lim_{x\to 4^+} f(x) =$ 1
$\lim_{x\to -3} f(x) =$ 2	$\lim_{x\to -1} f(x) =$ dne	$\lim_{x\to 2} f(x) =$ dne	$\lim_{x\to 4} f(x) =$ 1
$f(-3) =$ dne	$f(-1) =$ 3	$f(2) =$ 3	$f(4) =$ 1

(b) Circle YES or NO for each of the following.

i. Is f continuous at -3? YES (NO)

ii. Is f continuous at -1? YES (NO)

iii. Is f continuous at 2? YES (NO)

iv. Is f continuous at 4? (YES) NO

2. (5 points) Find the average rate of change of $f(x) = x^2 - 10x$ over the interval $[1, 3]$.

$$\frac{f(3)-f(1)}{3-1} = \frac{[3^2-10\cdot 3]-[1^2-10\cdot 1]}{2}$$

$$= \frac{(9-30)-(1-10)}{2}$$

$$= \frac{-21-(-9)}{2} = \frac{-21+9}{2} = -\frac{12}{2} = -6.$$

3. (10 points)

(a) State the definition of derivative.

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

(b) Find the derivative $f'(x)$ of the function $f(x) = 5x^2 - 4x - 7$ *using the definition of derivative.*

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

$$= \lim_{h\to 0} \frac{[5(x+h)^2-4(x+h)-7]-[5x^2-4x-7]}{h}$$

$$= \lim_{h\to 0} \frac{5(x^2+2hx+h^2)-4x-4h-7-5x^2+4x+7}{h}$$

$$= \lim_{h\to 0} \frac{5x^2+10hx+5h^2-4h-5x^2}{h}$$

$$= \lim_{h\to 0} \frac{10hx+5h^2-4h}{h}$$

$$= \lim_{h\to 0} \frac{h(10x+5h-4)}{h}$$

$$= \lim_{h\to 0} (10x+5h-4)$$

$$= 10x+5\cdot 0-4$$

$$= 10x-4.$$

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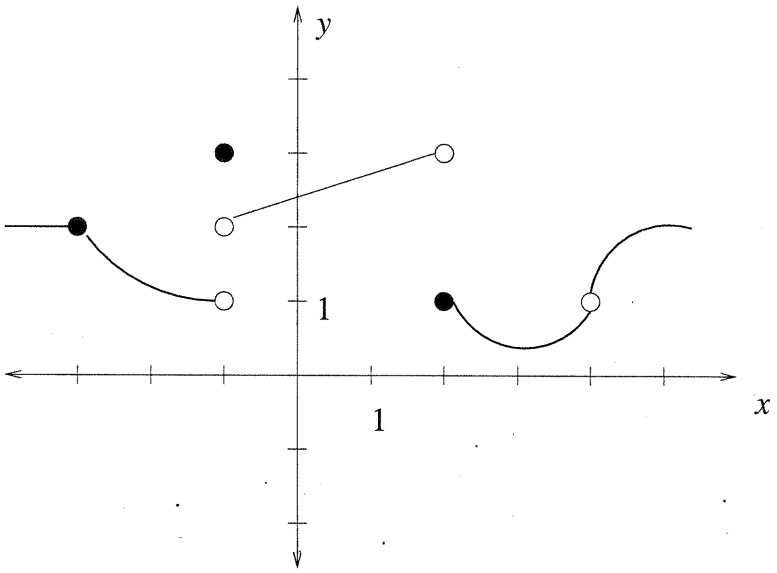
Quiz 1: Version D

Show your reasoning. Use standard notation correctly.

1. (10 points) The function f is depicted below.



(a) Find each of the following or state "does not exist" ("dne").

$\lim_{x\to -3^-} f(x) =$ 2	$\lim_{x\to -1^-} f(x) =$ 1	$\lim_{x\to 2^-} f(x) =$ 3	$\lim_{x\to 4^-} f(x) =$ 1
$\lim_{x\to -3^+} f(x) =$ 2	$\lim_{x\to -1^+} f(x) =$ 2	$\lim_{x\to 2^+} f(x) =$ 1	$\lim_{x\to 4^+} f(x) =$ 1
$\lim_{x\to -3} f(x) =$ 2	$\lim_{x\to -1} f(x) =$ dne	$\lim_{x\to 2} f(x) =$ dne	$\lim_{x\to 4} f(x) =$ 1
$f(-3) =$ 2	$f(-1) =$ 3	$f(2) =$ 1	$f(4) =$ dne

(b) Circle YES or NO for each of the following.

i. Is f continuous at -3? (YES) NO

ii. Is f continuous at -1? YES (NO)

iii. Is f continuous at 2? YES (NO)

iv. Is f continuous at 4? YES (NO)

2. (5 points) Find the average rate of change of $f(x) = x^2 - 4x$ over the interval $[1, 3]$.

$$\frac{f(3)-f(1)}{3-1} = \frac{[(3)^2-4(3)]-[1^2-4\cdot 1]}{2}$$

$$= \frac{[9-12]-[1-4]}{2}$$

$$= \frac{-3-(-3)}{2} = \frac{0}{2} = 0.$$

3. (10 points)

(a) State the definition of derivative.

(3) $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$

(b) Find the derivative $f'(x)$ of the function $f(x) = 9x^2 - 3x - 2$ *using the definition of derivative.*

(7) $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$

$$= \lim_{h\to 0} \frac{[9(x+h)^2-3(x+h)-2]-[9x^2-3x-2]}{h}$$

$$= \lim_{h\to 0} \frac{9(x^2+2hx+h^2)-3x-3h-2-9x^2+3x+2}{h}$$

$$= \lim_{h\to 0} \frac{9x^2+18hx+9h^2-3h-9x^2}{h}$$

$$= \lim_{h\to 0} \frac{18hx+9h^2-3h}{h}$$

$$= \lim_{h\to 0} \frac{h(18x+9h-3)}{h}$$

$$= \lim_{h\to 0} (18x+9h-3)$$

$$= 18x - 9\cdot 0 - 3$$

$$= 18x - 3.$$