Math 125 GQ Definition of Derivative and Slope of a Curve.(7.3)

Name_____Section:_____Date:_____

24 points Show ALL work for full credit. Group No:_____

Show ALL work for full credit. Write all solutions on THIS paper...no additional papers attached, please!

General Rubric - In case you can't read something on a's key.

1. Write the limit definition for derivative (every part of it including the limit notation at the beginning!):

$f'(x) =$ (1pt) $\lim_{\Delta x \to 0}$ (1pt) $f(x+\Delta x)$ (1pt) $-f(x)$ (1pt) Δx

4

---

2. Use the **limit definition** for slope of a curve to find the slope of $f(x) = -8x + 4$ at $x = 5$. (Use your lim symbol at EVERY step that is necessary!) Label using $m = f'(5) =$ if plugging in x=5 to start or $m = f'(x) =$ if keeping everything in terms of 'x' to start, i.e., plugging in x=5 at the end.

* If only use shortcuts only 1 pt. total.

(1pt) for label somewhere m or f'(5) or f'(x)

(1pt) for lim $\Delta x \to 0$ at every necessary step

(1pt) for some work (correct)

(1pt) for canceling Δx correctly

(1pt) for final answer

(2pt) for correct f(x+Δx) set up

(1pt) for correct −(f(x))

(1pt) for Δx at every necessary step

9

* If they don't use f'(5) & only use f'(x), don't count off, just write it for them.

---

3. Find the derivative of $f(x) = x^2 - 6x + 9$ using the limit definition of derivative. (Use your lim symbol at EVERY step that is necessary!) Label all steps appropriately. If you need more room, continue on the back of this page. Do NOT attach additional paper, please!

* Only 2pts total if they only use shortcuts

(1pt) for f'(x) somewhere

(1pt) for lim $\Delta x \to 0$ at every necessary step

(1pt) for some correct work

(1pt) for canceling/factoring Δx

(1pt) for distributing (−) correctly

(1pt) for $\frac{\quad}{\Delta x}$ at every step

(2pt) for final answer

(2pts) for correct f(x+Δx) step

(1pt) for correct (−f(x)) step

11

Math 125 GQ Definition of Derivative and Slope of a Curve.(7.3)

Name ~~Key~~ 24 Section:____________ Date:____________

24 points Show ALL work for full credit. Group No:____________

Show ALL work for full credit. Write all solutions on THIS paper...no additional papers attached, please!

1. Write the limit definition for derivative (every part of it including the limit notation at the beginning!):

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

(1) (1) (1) (1) — if +, lose point — total points: 4

---

2. Use the **limit definition** for slope of a curve to find the slope of $f(x) = -8x + 4$ at $x = 5$. $f(5) = -8(5)+4 = -40+4 = -36$

(Use your lim symbol at EVERY step that is necessary!) Label using $m = f'(5) =$ if plugging in x=5 to start or $m = f'(x) =$ if keeping everything in terms of 'x' to start, i.e., plugging in x=5 at the end. (1)

(1) notation: m or $f'(5) = \lim_{\Delta x \to 0} \frac{-8(5+\Delta x)+4-(-36)}{\Delta x}$ (2) (1) (1)

$= \lim_{\Delta x \to 0} \frac{-40 - 8\Delta x + 40}{\Delta x}$ — some work (1)

(1) cancel Δx: $= \lim_{\Delta x \to 0} \frac{-8\Delta x}{\Delta x} = \lim_{\Delta x \to 0} -8 = \boxed{-8}$ (1)

(1) lim at necessary steps

Note: If shortcuts used, only get (1) point!

OR

(1) notation: $f'(x) = \lim_{\Delta x \to 0} \frac{-8(x+\Delta x)+4-(-8x+4)}{\Delta x}$ (2) (1)

$= \lim_{\Delta x \to 0} \frac{-8x - 8\Delta x + 4 + 8x - 4}{\Delta x}$ — some work (1)

(1) $= \lim_{\Delta x \to 0} \frac{-8\Delta x}{\Delta x} = \lim_{\Delta x \to 0} (-8) = -8$ (1)

(1) lim at every step

So $f'(5) = -8$

*If they put $f'(x) = -8$, emphasize $f'(5) = -8$ by writing it down for them.

(1) cancel Δx. Note: If they cancel Δx w/ all other terms in some step, point out to them that needs its own step!

total: 9

---

3. Find the derivative of $f(x) = x^2 - 6x + 9$ using the limit definition of derivative.

(Use your lim symbol at EVERY step that is necessary!) Label all steps appropriately. If you need more room, continue on the back of this page. Do NOT attach additional paper, please!

$f'(x) = \lim_{\Delta x \to 0} \frac{(x+\Delta x)^2 - 6(x+\Delta x) + 9 - (x^2 - 6x + 9)}{\Delta x}$ (2) (1) (1) — somewhere (1)

$= \lim_{\Delta x \to 0} \frac{(x^2 + 2x\Delta x + (\Delta x)^2 - 6x - 6\Delta x + 9 - x^2 + 6x - 9}{\Delta x}$ — distribute (−) (1) — some work (1)

$= \lim_{\Delta x \to 0} \frac{x^2 + 2x(\Delta x) + (\Delta x)^2 - 6x - 6\Delta x + 9 - x^2 + 6x - 9)}{\Delta x}$

$= \lim_{\Delta x \to 0} \frac{2x(\Delta x) + (\Delta x)^2 - 6\Delta x}{\Delta x}$ — (1) for factor and/or cancel Δx

$= \lim_{\Delta x \to 0} (2x + (\Delta x) - 6) = \boxed{2x - 6}$ (2) answer

(1) for lim $\Delta x \to 0$ at every necessary step.

They would only get these two points if they only used shortcut rules.

total: 11

Math 125 GQ Definition of Derivative and Slope of a Curve..(7.3)

Name Key/24 Section:_____ Date:_____

24 points Show ALL work for full credit. Group No:_____

Show ALL work for full credit. Write all solutions on THIS paper...no additional papers attached, please!

(*See Rubric for version a (curve 1 dot (7.3)) !)

1. Write the limit definition for derivative (every part of it including the limit notation at the beginning!):

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

---

2. Use the **limit definition** for slope of a curve to find the slope of $f(x)=-10x+4$ at $x=5$. $f(5)=-10(5)+4=-50+4=-46$
(Use your lim symbol at EVERY step that is necessary!) Label using $m=f'(5)=$ if plugging in x=5 to start or $m=f'(x)=$ if keeping everything in terms of 'x' to start, i.e., plugging in x=5 at the end.

M or $f'(5)=$

$$=\lim_{\Delta x\to 0}\frac{-10(5+\Delta x)+4-(-46)}{\Delta x}=$$

$$=\lim_{\Delta x\to 0}\frac{-50-10\Delta x+4+46}{\Delta x}=$$

$$=\lim_{\Delta x\to 0}\frac{-10\Delta x}{\Delta x}=\lim_{\Delta x\to 0}(-10)=$$

$$=\boxed{-10}$$

or

$$f'(x)=\lim_{\Delta x\to 0}\frac{-10(x+\Delta x)+4-(-10x+4)}{\Delta x}=$$

$$=\lim_{\Delta x\to 0}\frac{-10x-10\Delta x+4+10x-4}{\Delta x}=$$

$$=\lim_{\Delta x\to 0}\frac{-10\Delta x}{\Delta x}=\lim_{\Delta x\to 0}(-10)=$$

$$=\boxed{-10}$$

So $f'(5)=-10$

---

3. Find the derivative of $f(x)=x^2-8x+15$ using the limit definition of derivative.
(Use your lim symbol at EVERY step that is necessary!) Label all steps appropriately. If you need more room, continue on the back of this page. Do NOT attach additional paper, please!

$$f'(x)=\lim_{\Delta x\to 0}\frac{(x+\Delta x)^2-8(x+\Delta x)+15-(x^2-8x+15)}{\Delta x}$$

$$=\lim_{\Delta x\to 0}\frac{x^2+2x(\Delta x)+(\Delta x)^2-8x-8\Delta x+15-x^2+8x-15}{\Delta x}$$

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

$$=\lim_{\Delta x\to 0}(2x+(\Delta x)-8)=\boxed{2x-8}$$

Math 125 GQ Definition of Derivative and Slope of a Curve...(7.3)

Name Key/24 Section:_____ Date:_____

24 points Show ALL work for full credit. Group No:_____

Show ALL work for full credit. Write all solutions on THIS paper...no additional papers attached, please!

(* see Rubric for resubmit a (corrected) (7.3)!)

1. Write the limit definition for derivative (every part of it including the limit notation at the beginning!):

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

---

2. Use the **limit definition** for slope of a curve to find the slope of $f(x)=-9x+4$ at $x=5$.
(Use your lim symbol at EVERY step that is necessary!) Label using $m=f'(5)=$ if plugging in x=5 to start or $m=f'(x)=$ if keeping everything in terms of 'x' to start, i.e., plugging in x=5 at the end.

$f(5)=-9(5)+4=-45+4=-41$

M or $f'(5)=$

$$=\lim_{\Delta x\to 0}\frac{-9(5+\Delta x)+4-(-41)}{\Delta x}=$$

$$=\lim_{\Delta x\to 0}\frac{-45-9(\Delta x)+4+41}{\Delta x}=$$ OK

$$=\lim_{\Delta x\to 0}\frac{-9(\Delta x)}{\Delta x}=\lim_{\Delta x\to 0}(-9)$$

$$=-9$$

$f'(x)=$

$$=\lim_{\Delta x\to 0}\frac{-9(x+\Delta x)+4-(-9x+4)}{\Delta x}=$$

$$=\lim_{\Delta x\to 0}\frac{-9x-9\Delta x+4+9x-4}{\Delta x}=$$

$$=\lim_{\Delta x\to 0}\frac{-9\Delta x}{\Delta x}=\lim_{\Delta x\to 0}(-9)=$$

$$=\boxed{-9} \quad \text{so } f'(5)=-9$$

---

3. Find the derivative of $f(x)=x^2-5x+6$ using the limit definition of derivative.
(Use your lim symbol at EVERY step that is necessary!) Label all steps appropriately. If you need more room, continue on the back of this page. Do NOT attach additional paper, please!

$$f'(x)=\lim_{\Delta x\to 0}\frac{(x+\Delta x)^2-5(x+\Delta x)+6-(x^2-5x+6)}{\Delta x}$$

$$=\lim_{\Delta x\to 0}\frac{x^2+2x(\Delta x)+(\Delta x)^2-5x-5(\Delta x)+6-x^2+5x-6}{\Delta x}$$

$$=\lim_{\Delta x\to 0}\frac{2x(\Delta x)+(\Delta x)^2-5(\Delta x)}{\Delta x}$$

$$=\lim_{\Delta x\to 0}(2x+(\Delta x)-5)=\boxed{2x-5}$$

Math 125 GQ Definition of Derivative and Slope of a Curve....(7.3)

Name Key (m) Section:_____ Date:_____

24 points Show ALL work for full credit. Group No:_____

Show ALL work for full credit. Write all solutions on THIS paper...no additional papers attached, please!

(*See Rubric for versions a (curve) (7.3))

1. Write the limit definition for derivative (every part of it including the limit notation at the beginning!):

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

---

2. Use the **limit definition** for slope of a curve to find the slope of $f(x)=-5x+4$ at $x=5$.
(Use your lim symbol at EVERY step that is necessary!) Label using $m=f'(5)=$ if plugging in x=5 to start or $m=f'(x)=$ if keeping everything in terms of 'x' to start, i.e., plugging in x=5 at the end.

$f(5)=-5(5)+4=-21$

m or $f'(5)=$

$=\lim_{\Delta x\to 0}\frac{-5(5+\Delta x)+4-(-21)}{\Delta x}=$

$=\lim_{\Delta x\to 0}\frac{-25-5\Delta x+4+21}{\Delta x}=$

$=\lim_{\Delta x\to 0}\frac{-5(\Delta x)}{\Delta x}=\lim_{\Delta x\to 0}(-5)$

$=-5$

OR

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

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

$=\lim_{\Delta x\to 0}\frac{-5x-5\Delta x+4+5x-4}{\Delta x}=$

$=\lim_{\Delta x\to 0}\frac{-5(\Delta x)}{\Delta x}=\lim_{\Delta x\to 0}(-5)=-5$

So $f'(5)=-5$

---

3. Find the derivative of $f(x)=x^2-9x+20$ using the limit definition of derivative.
(Use your lim symbol at EVERY step that is necessary!) Label all steps appropriately. If you need more room, continue on the back of this page. Do NOT attach additional paper, please!

$$f'(x)=\lim_{\Delta x\to 0}\frac{(x+\Delta x)^2-9(x+\Delta x)+20-(x^2-9x+20)}{\Delta x}$$

$$=\lim_{\Delta x\to 0}\frac{x^2+2x(\Delta x)+(\Delta x)^2-9x-9(\Delta x)+20-x^2+9x-20}{\Delta x}$$

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

$$=\lim_{\Delta x\to 0}(2x+\Delta x-9)=\boxed{2x-9}$$

Math 125 GQ Definition of Derivative and Slope of a Curve.....(7.3)

Name Key /24 Section:_____ Date:_____

24 points Show ALL work for full credit. Group No:_____

Show ALL work for full credit. Write all solutions on THIS paper...no additional papers attached, please!

(see Rubric for revision a (curve. (7.3))!)

1. Write the limit definition for derivative (every part of it including the limit notation at the beginning!):

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

---

2. Use the **limit definition** for slope of a curve to find the slope of $f(x)=-3x+4$ at $x=5$.
(Use your lim symbol at EVERY step that is necessary!) Label using $m=f'(5)=$ if plugging in x=5 to start or $m=f'(x)=$ if keeping everything in terms of 'x' to start, i.e., plugging in x=5 at the end.

$f(5)=-3(5)+4=-11$

$$m=f'(5)=\lim_{\Delta x\to 0}\frac{-3(5+\Delta x)+4-(-11)}{\Delta x}=\lim_{\Delta x\to 0}\frac{-15-3\Delta x+4+11}{\Delta x}=\lim_{\Delta x\to 0}\frac{-3(\Delta x)}{\Delta x}=\lim_{\Delta x\to 0}(-3)=-3$$

OR

$$f'(x)=\lim_{\Delta x\to 0}\frac{-3(x+\Delta x)+4-(-3x+4)}{\Delta x}=\lim_{\Delta x\to 0}\frac{-3x-3\Delta x+4+3x-4}{\Delta x}=\lim_{\Delta x\to 0}\frac{-3(\Delta x)}{(\Delta x)}=\lim_{\Delta x\to 0}(-3)=-3$$

So $f'(5)=-3$

---

3. Find the derivative of $f(x)=x^2-10x+21$ using the limit definition of derivative.
(Use your lim symbol at EVERY step that is necessary!) Label all steps appropriately. If you need more room, continue on the back of this page. Do NOT attach additional paper, please!

$$f'(x)=\lim_{\Delta x\to 0}\frac{(x+\Delta x)^2-10(x+\Delta x)+21-(x^2-10x+21)}{\Delta x}=\lim_{\Delta x\to 0}\frac{x^2+2x(\Delta x)+(\Delta x)^2-10x-10(\Delta x)+21-x^2+10x-21}{\Delta x}=\lim_{\Delta x\to 0}\frac{2x(\Delta x)+(\Delta x)^2-10(\Delta x)}{\Delta x}=\lim_{\Delta x\to 0}(2x+(\Delta x)-10)=\boxed{2x-10}$$