MAC 2311 - Period: ____

Quiz 5 - Form A

October 6, 2015

Name: KEY

Please write your name and form on your paper.

Show your work to earn full credit.

1. State the limit definition of the derivative $f'(a)$. (*2 points*)

2. Given that $f(x) = \sqrt{x+5}$, **use the limit definition of the derivative** to compute $f'(1)$ and find an equation of the tangent line. (*2 points*)

3. Find the values of x where $y = x^3 + 27$ and $y = x^2 + 5x - 6$ have parallel tangent lines. (You may use the power rule to compute any necessary derivatives for this problem only). (*2 points*)

$\boxed{1}$ $f'(a) = \lim_{h\to 0} \dfrac{f(a+h)-f(a)}{h}$ (1) (1) OR $f'(a) = \lim_{x\to a} \dfrac{f(x)-f(a)}{x-a}$.

$\boxed{2}$ $f(1+h) - f(1) = \sqrt{(1+h)+5} - \sqrt{1+5} = \sqrt{6+h} - \sqrt{6}$

(1) for work

Mult by conjugate: $= \dfrac{6+h-6}{\sqrt{6+h}+\sqrt{6}} = \dfrac{h}{\sqrt{6+h}+\sqrt{6}}$

Then ~~that~~ $f'(1) = \lim_{h\to 0} \dfrac{f(1+h)-f(1)}{h} = \lim_{h\to 0} \dfrac{1}{\sqrt{6+h}+\sqrt{6}} = \dfrac{1}{2\sqrt{6}}$ $\frac{1}{2}$

Equation of the tangent line: $y - f(1) = f'(1)(x-1)$

$\Longleftrightarrow \boxed{y - \sqrt{6} = \dfrac{1}{2\sqrt{6}}(x-1)}$ $\frac{1}{2}$

$\boxed{3}$ Let $f(x) = x^3 + 27$ and $g(x) = x^2 + 5x - 6$. Set $f' = g'$ & solve for x.

$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ correct derivatives

$f'(x) = g'(x) \Longleftrightarrow 3x^2 = 2x + 5$

$\Longleftrightarrow 3x^2 - 2x - 5 = 0$

$\Longleftrightarrow (3x-5)(x+1) = 0$

So $\boxed{x = \frac{5}{3}, -1}$ $\frac{1}{2}$

MAC 2311 - Period: ____
Quiz 5 - Form B
October 6, 2015

Name: KEY
Write your name and form on both sheets of paper.
Show your work to earn full credit.

1. State the limit definition of the derivative $f'(b)$. (*2 points*)

2. Given that $f(x) = \sqrt{x+4}$, **use the limit definition of the derivative** to compute $f'(-1)$ and find an equation of the tangent line. (*2 points*)

3. Find the values of x where $y = x^3 + 8$ and $y = x^2 + 5x + 6$ have parallel tangent lines. (You may use the power rule to compute any necessary derivatives for this problem only). (*2 points*)

$\boxed{1}$ on form A

$\boxed{2}$ $f(-1+h) - f(-1) = \sqrt{-1+h+4} - \sqrt{-1+4} = \sqrt{h+3} - \sqrt{3}$

1 for work

Mult. by conjugate: $= \dfrac{h+3-3}{\sqrt{h+3}+\sqrt{3}} = \dfrac{h}{\sqrt{h+3}+\sqrt{3}}$

Then $f'(-1) = \lim_{h\to 0} \dfrac{f(-1+h)-f(-1)}{h} = \lim_{h\to 0} \dfrac{1}{\sqrt{h+3}+\sqrt{3}} = \dfrac{1}{2\sqrt{3}}$ $\frac{1}{2}$

Equation of the tangent line: $y - f(-1) = f'(-1)(x-(-1))$

$\Longleftrightarrow \boxed{y - \sqrt{3} = \dfrac{1}{2\sqrt{3}}(x+1)}$ $\frac{1}{2}$

$\boxed{3}$ Same as form A. (Constant terms go to zero when derivative is taken).

MAC 2311 - Period: ____
Quiz 5 - Form C
October 6, 2015

Name: KEY
Write your name and form on both sheets of paper.
Show your work to earn full credit.

1. State the limit definition of the derivative $f'(c)$. (*2 points*)

2. Given that $f(x) = \sqrt{x+6}$, **use the limit definition of the derivative** to compute $f'(-1)$ and find an equation of the tangent line. (*2 points*)

3. Find the values of x where $y = x^3 - 8$ and $y = x^2 + 5x + 6$ have parallel tangent lines. (You may use the power rule to compute any necessary derivatives for this problem only). (*2 points*)

$\boxed{1}$ Same as form A

$\boxed{2}$ $f(-1+h) - f(-1) = \sqrt{-1+h+6} - \sqrt{-1+6} = \sqrt{5+h} - \sqrt{5}$

1 for work

Multiply by conjugate: $= \dfrac{5+h-5}{\sqrt{5+h}+\sqrt{5}} = \dfrac{h}{\sqrt{5+h}+\sqrt{5}}$

Then $f'(-1) = \lim\limits_{h\to 0} \dfrac{f(-1+h)-f(-1)}{h} = \lim\limits_{h\to 0} \dfrac{1}{\sqrt{5+h}+\sqrt{5}} = \dfrac{1}{2\sqrt{5}}$. $\frac{1}{2}$

Equation of tangent line: $y - f(-1) = f'(-1)(x-(-1))$

$\iff \boxed{y - \sqrt{5} = \dfrac{1}{2\sqrt{5}}(x+1)}$. $\frac{1}{2}$

$\boxed{3}$ Same as form A.

MAC 2311 - Period: ____
Quiz 5 - Form D
October 6, 2015

Name: KEY
Write your name and form on both sheets of paper.
Show your work to earn full credit.

1. State the limit definition of the derivative $f'(d)$. (*2 points*)

2. Given that $f(x) = \sqrt{x+2}$, use **the limit definition of the derivative** to compute $f'(1)$ and find an equation of the tangent line. (*2 points*)

3. Find the values of x where $y = x^3 - 27$ and $y = x^2 + 5x - 6$ have parallel tangent lines. (You may use the power rule to compute any necessary derivatives for this problem only). (*2 points*)

$\boxed{1}$ Same as form A.

$\boxed{2}$ $f(1+h) - f(1) = \sqrt{1+h+2} - \sqrt{1+2} = \sqrt{3+h} - \sqrt{3}$

1 for work

Multiply by conjugate: $= \dfrac{3+h-3}{\sqrt{3+h}+\sqrt{3}} = \dfrac{h}{\sqrt{3+h}+\sqrt{3}}$

Then $f'(1) = \lim\limits_{h \to 0} \dfrac{f(1+h)-f(1)}{h} = \lim\limits_{h \to 0} \dfrac{1}{\sqrt{3+h}+\sqrt{3}} = \dfrac{1}{2\sqrt{3}}$ $\frac{1}{2}$

Equation of the tangent line:

$$y - f(1) = f'(1)(x-1)$$

$$\Longleftrightarrow \boxed{y - \sqrt{3} = \frac{1}{2\sqrt{3}}(x-1)}$$ $\frac{1}{2}$

$\boxed{3}$ Same as form A.

Problem References:

1. Section 3.1 Summary (and used in pretty much every problem) and Webassign HW 5 #10.
2. Section 3.1 #37 and Webassign HW 5 #12.
3. Section 3.2 #52.