AP Calc WS#8 Derivative Function Name: \_\_\_\_\_\_

1. Find derivative by definition

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|  | Find derivative of f(x) = x3, then f ' (3) |

Given $f(x)=\sqrt{x}$, find the derivative f ' (4) $f\left(x\right)=\frac{x++1}{x-1}$ find derivative f ' (2)

Find derivative by formula

* **If f(x) = xn then** $\frac{d}{dx}$**f (x) = f '(x) = nxn-1 NEVER**
* **If f(x) = g(x) ± h(x) then** $\frac{d}{dx}$**f (x) = f '(x) = g '(x) ± h '(x) FORGET**
* **If f(x) = kg(x) then** $\frac{d}{dx}$**f (x) = f '(x) = k g'(x) THESE**
* **If f(x) = C (a constant number) then** $\frac{d}{dx}$**f (x) = f '(x) = 0 FORMULA**

 Find the following derivative

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| $\frac{d}{dx}$ x5 | $\frac{d}{dx}$5x7 – 11x3 + 12x – 47 | $\frac{d}{dx}$4.773  |
| $\frac{d}{dx} 13 – x$  | $$\frac{d}{dx}\frac{x^{2}}{2}-x+1$$ | $\frac{d}{dx } $x4/3 |
| $\frac{d}{dx}$x-3 + 2 | $$\frac{d}{dx}\frac{2}{x^{2}}-5x+\frac{1}{x}$$ | $\frac{d}{dx}$x1/2 |
| $$\frac{d}{dx}\frac{x^{{1}/{2}}}{2}$$ | $$\frac{d}{dx}3\sqrt{x}+\frac{1}{\sqrt{x}}$$ | $\frac{d}{dx}$(3x - 4)2 |
| $\frac{d}{dt} $t4 – 6y2 | $\frac{d}{dx}$ 3x5 - 2t + 7 | $\frac{d}{dt}$3x5 - 2t + 7 |

Recall: Instantaneous rate of change = **slope of tangent line m**

 = **f ' (a) derivative of the function f at the point a** (= $\lim\_{x\to a}\frac{f(x)-f(a)}{(x-a)}$ )

Tell whether f(x) is increasing or decreasing at x = c. and how fast is the change?

 Hint: The slope f '(c) is positive or negative?

f(x) = x ½ + 2x – 13, c = 4 f(x) = x -2 – 3x + 11, c = 1

f(x) = x1.5 – 6x + 30, c = 9 f(x) = $-3\sqrt{x}+x+1$, c = 2

Given f '(x) = 3x2 – 10x + 5, find the “original” function f(x). Hint: Reverse problem

Find the intersection between the function and its derivative and write it in (x, y) format.

 REMEMBER IN CALCULUS, ALWAYS WRITE WITH 3 DECIMAL PLACE

 a. f(x) = $\frac{x^{3}}{3}-x^{2}-3x+5$ b. g(x) = $\frac{x^{3}}{3}-2x^{2}+3x+9$

Find the point on the graph f(t) = t3 – 2t + 4 where the tangent line is horizontal

Does the curve y = x4 – 2x2 + 2 have any horizontal tangents? If so, where?

How about the curve 0.2x4 – 9.7x3 – 2x2 + 5 + 4?

Compute the derivative using limit definition

a. f(x) = x2 f(x) = x-2

|  |  |
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|  | *Differentiability* *(How f '(a) might fail to exist)****Theorem: If f has a derivative*** ***at x = a, then f is continuous***  ***at x = a****The converse of this Theorem is not always true yet.* *How does a function does not have derivative?**Obviously, if function does not have a limit at the point, then it won't have slope (or derivative).* *How about continuous? Do research about it and write it here.* |

Relationships between the Graphs of f and f '

The graph of f(x) is given below, sketch the graph of f '(x)

 Algebraically

 f(x) = ax3 + bx2 + cx + d. Find f(x) and f ’(x)

