AP Calc AB Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 WS Assessment

 Target 6:

Derivative rules

**I can:**

* Calculate derivatives of familiar functions
* Calculate derivatives of products and quotients of differentiable functions

Unit 2: Differentiation: Definition and Fundamental Properties

HW Target 6

Unit 2 Progress Check MCQ Part B

Review tangent of the line

Given function f(x) = x2 + 6. Find the tangent of this curve at point (2, 10). Sketch

Find the tangent of this curve at point (2, 1). Sketch

Given function f(x) = 2x – x2. Find the tangent of this curve at point (2, 9). Sketch

Given function y2 – x3 – 4y + 4 = 0. Find the tangent of this curve at point (1,2). Sketch. Stamp

*Differentiability (how f '(a) might fail to exist) A function will not have a derivative at a point P(a, f(a)) where the slopes of the secant lines,* $\frac{f(x)-f(a)}{x-a}$*fail to approach a limit as x approaches a.*

|  |  |  |  |
| --- | --- | --- | --- |
|  **corner**(left limit ≠ right limit) | a **cusp**left = -∞ ; right = ∞ | a **vertical tangent** | a **discontinuity** |
|  |  |  |  |

Find all points in the domain of f(x) = |x – 2 | + 3 where the function is not differentiable.

The graph of a function over a closed interval D is given. At what domain points does the function appear to be

(a) differentiable? (b) continuous but not differentiable? (c) neither continuous nor

differentiable?



*Take “picture” of basic derivative cheatsheet*

Find the derivative of the following function

f(x) = 3 cos x + 5 sin x f(x) =3ex + 10x3 – ln(x)

You write the function that have sin, cos, exp and log. Give and take to your partner.

Composite Function - *Chain Rule*

 Composite function is obtained by “plugging” one function into another.

 For example with two functions g(x) = x3 + 1 and f(x) = $\sqrt{x}$.

 The composite function f(g(x)) = $\sqrt{x^{3}+1} $while g(f(x)) = $(\sqrt{x})^{3}+1$

Chain Rule: If f and g are differentiable (derivative-able) then the composite function f(g(x)) is differentiable and (f(g(x)))' =[ f '(g(x))] [g' (x)] say [outside ' (inside) ] [ inside ' ]

 By setting u = g(x), we may also write the Chain Rule as $\frac{d}{dx}f(u)=f'(u)\frac{du}{dx}$

Example: Find the derivative of y = $\sqrt{x^{3}+1}$.

As we've seen above f(x) = $\sqrt{x}$ (outside) and g(x) = x3 + 1 (inside)

By the Chain Rule

 $\frac{d}{dx}\sqrt{x^{3}+1}=out'(inside)×inside'=\frac{1}{2}(x^{3}+1)^{{-1}/{2}}(3x^{2})=\frac{3x^{2}}{2\sqrt{x^{3}+1}}$

 Find the derivative of y = (x3 + 7)2 Hint f(x) = x2 (outside) g(x) = x3 +7 (inside)

Find the derivative of y = (x2 – 1)3

Find the derivative of y = sin (x5) Hint f(x) = sin(x) (outside) g(x) = x5 (inside)

Find the derivative of y = (cos x)4

 $\frac{d}{dx}sin(x^{2}+x)$ $\frac{d}{dx}cos(7-5x)$

y = (1 + cos 2x)2 y = cos2 (x3 + x2)

*Product Rule* $\frac{d}{dx}(uv)=u\frac{dv}{dx}+v\frac{du}{dx}$ *or the notation (uv)' = u'v + v'u*

Find the derivative of y = (x4)(cos 6x) y ' = (x4)' (cos6x) + (x4)(cos6x) '

 = \_\_\_\_\_\_\_ (cos6x) + (x4) \_\_\_\_\_\_\_

Find the derivative of y = (3x – 8)7 (4x + 9)5 and simplify

Find the derivative of y = (x2 + 1) (x3 + 3) and simplify

Find the derivative of f(x) = (x3 − 4x2 )ex cos x.

Find the derivative of y = x3(5x – 2)4sin 6x

Find the derivative of y = 4sin(3t)cos(5t) both ways

Let y = uv be the product of the functions u and v. Find y'(2) if

 u(2) = 3 u'(2) = -4 v(2) = 1 and v'(2) = 2

*Quotient Rule* $\frac{d}{dx}(\frac{u}{v})=\frac{v\frac{du}{dx}-u\frac{dv}{dx}}{v^{2}}$ *or* $(\frac{u}{v})'=\frac{u'v-v'u}{v^{2}}$***lo di hi – hi di lo all over v square***

 $f(x)=\frac{sin5x}{8x-3}$ $f'(x)=\frac{(sin5x)'(8x-3)-(8x-3)(sin5x)'}{(8x-3)^{2}}$ = $\frac{(?)(8x-3)-(?)(sin5x)}{(8x-3)^{2}}$

Find the derivative of $y=\frac{(5x-2)^{7}}{(4x+9)^{3}}$

Find the equation for the line tangent to the curve $y=\frac{x^{2}+3}{2x} $at the point (1, 2). Graph them

Let y = u/v be the product of the functions u and v. Find y'(2) if

 u(2) = 3 u'(2) = -4 v(2) = 1 and v'(2) = 2

The reaction of the body to a dose of medicine can often be represent by an equation of the form

 $R=M^{2}(\frac{C}{2}-\frac{M}{3})$ where C is a positive constant and M is the amount of medicine

 absorbed in the blood.

If the reaction is a change in blood pressure, R is measured in millimeters of mercury.

If the reaction is a change in in temperature, R is measured in degrees, and so on.

Find dR/dM. This derivative, as function of M, is called the sensitivity of the body to medicine.

 *(Source: Mathematical Models in Biology)*

Let f(x) = x4 – 4x2.

a. Find all the points where f has horizontal tangents.

b. Find an equation of the tangent line at x = 1

c. Find an equation of the normal line at x = 1 (normal line is perpendicular to tangent line)

 Assessment

Given function f(x) = x2. Find the tangent of this curve at point (2, 0). Sketch

Fill in the table



Find the derivative of the following function

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