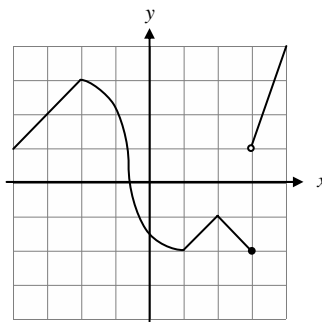


1. Where is $f(x)$ NOT differentiable? Why?



2. If $P(x) = 4x^3 - 7x - 10$ is the equation for profit on x items, find the marginal profit of the 12th item.

3. When does $f'(2)$ exist, for some function $f(x)$. (limits....)

4. If $f(x) = \begin{cases} 2ax^2 + b & x \geq 1 \\ -3x + 4 & x < 1 \end{cases}$, find a and b so that f is both continuous and differentiable.

5. If $x(t) = t^2 - 8t + 12$ is a position of a particle moving along the x axis at time t , then

- a) Find the average velocity for the first 3 seconds.
- b) Find the velocity at $t = 4$ seconds.
- c) When is the object stopped?
- d) When is the acceleration of the object 0?
- e) When does the object change direction?
- f) When does the object slow down?
- g) When is the object moving left?

6. Find the equation of the *tangent line* to the curve $y = 2 \sin x \cos x$ at $x = \frac{\pi}{2}$.

7. Find $\lim_{h \rightarrow 0} \frac{\cos(\frac{\pi}{2} + h) - \cos(\frac{\pi}{2})}{h}$... Find $\lim_{h \rightarrow 0} \frac{\sqrt{4+h} - 2}{h}$ (doing a lot of work here? ...you're missing the point!)

8. Use the *alternative definition of the derivative* to find $f'(2)$ if $f(x) = \frac{1}{x}$.

9. Use the *alternative definition of the derivative* to find $f'(1)$ if $f(x) = 3x^2 + 5x$.

10. Given the following chart, find $f'(3)$ and explain its meaning.

$x = \text{minutes}$	$f(x) = \$$
1	4
2	6
3	9
4	11

11. If $s(x) = x^2 \sin x$ is a position of a particle at time t , $0 \leq t \leq 2\pi$.

- a) Find the velocity of the object at any time t .
- b) Find the acceleration of the object at any time t .
- c) When is the object stopped?
- d) When does the object change direction?
- f) When does the object speed up?
- g) Find the zeros of $s(x)$.
- h) Find the zeros of $v(x)$.
- i) Find the zeros of $a(x)$.

12. If $f(x)$ has a derivative at $x = 2$, tell whether or not each of the following **MUST** be true?

- a) $\lim_{x \rightarrow 2} f(x)$ exists
- b) $f'(2)$ exists
- c) $f''(2)$ exists.

d) $f(x)$ is continuous at $x = 2$.

e) $\lim_{x \rightarrow 2} \frac{f(x) - f(2)}{x - 2}$ exists.

f) $\lim_{h \rightarrow 0} \frac{f(2+h) - f(2)}{h}$ exists.

Be able to sketch a graph of a derivative from the function.
Be able to state and use the definition of a derivative.

AP Calculus AB Review for Chapter 3

13. Find $(f^{-1})'(2)$ if $f(x) = x^3 + 2x - 1$.

14. Given $a(t) = 5$, find $v(t)$ and $s(t)$, if $v(2) = 10$ and $s(0) = 5$.

15. Find the following derivatives

a) $y = \sin^{-1}(x^2)$ b) $y = \tan^{-1}(\sin x)$ c) $\sec^{-1}(\sqrt{x})$ d) e^{-x^2}
e) 5^{x^2+5} f) $y = \log_4(\sin^{-1}(2x))$ g) $(\sin x)^{e^x}$

16. Find y' for each function.

a) $y = 3^{\sin x}$

b) $y = e^{\ln x}$

17. Find $\frac{dy}{dx}$ if $x^2y + 3y^2 = x$.

18. Find $y'''(x)$ if $y = (4x+1)^7$