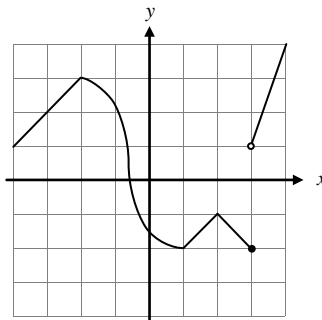


Unit 2 Review I

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.

"marginal profit of 12th item" means $P'(12)$

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

- Find the average velocity for the first 3 seconds.
- Find the velocity at $t = 4$ seconds.
- When is the object stopped?
- When is the acceleration of the object 0?

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

- When does the object change direction?
- When does the object slow down?
- 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 $f(x) = \frac{3}{x}$.

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. [Calculator] If $s(x) = \sqrt{x} \cos x$ is a position of a particle at time t , $0 \leq t \leq 2\pi$.

- Find the velocity of the object at any time t .
- Find the acceleration of the object at any time t .
- When is the object stopped?
- When does the object change direction?
- When does the object speed up?
- Find the zeros of $s(x)$.
- Find the zeros of $v(x)$.
- 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?

- $\lim_{x \rightarrow 2} f(x)$ exists
- $f'(2)$ exists
- $f''(2)$ 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 original and alternative definitions of a derivative ... **YEAH ... that's the long way!**