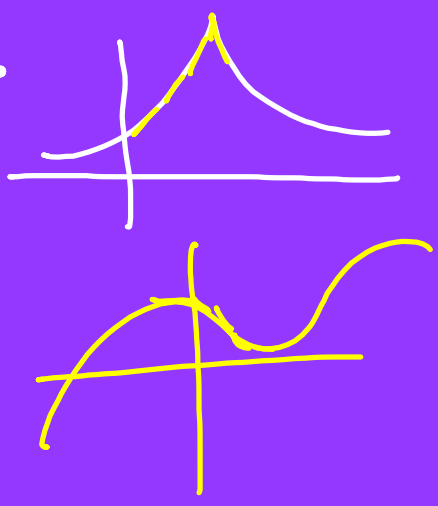
DIFFERENTIABILITY

no sharp points
no holes
no vertical asymptotes
no sudden change in slope.



1) $f(a)$ is defined.
2) $\lim_{x \to a}$ exists.
3) $f(a) = \lim_{x \to a} f(x)$
4) $f'(a)^- = f'(a)^+$

$$f(x) = \begin{cases} \sqrt{x} & \text{if } x \geq 4 \\ 6 - x & \text{if } x < 4 \end{cases} \qquad a = 4$$

1) $f(4) = \sqrt{4} = 2$

2) $\lim_{x \to 4^-} 6 - x = 2$

$\lim_{x \to 4^+} \sqrt{x} = 2$

$\lim_{x \to 4} f(x) = 2$

3) $f(4) = \lim_{x \to 4} f(x)$

f is continuous

4) $f'(4)^- = -1$

$f'(4)^+ = \frac{1}{2} x^{-1/2} = \frac{1}{2\sqrt{x}} = \frac{1}{2\sqrt{4}} = \frac{1}{4}$

$f'(4)^+ \neq f'(4)^-$

Not Differentiable

REVIEW

List:

1) A derivative represents the slope...

2) 1st Def. $\lim_{x \to a} \frac{f(x)-f(a)}{x-a}$

3) 2nd Def. $\lim_{h \to 0} \frac{f(x+h)-f(x)}{h}$

4) Derivatives of 6 trig functions

$f(x) = \sec^8(x^3-4x)$

$f(x) = \sec(x^3-4x)^8$

$f(x) = (\sec x)(x^3-4x)^8$

$f(x) = \frac{1}{7x^8} = \frac{1}{7}x^{-8}$

$= -\frac{8}{7}x^{-9}$

Eg of tangent line

1) Find slope: sub # in f'

2) Point: Find y by subbing x in original f.

3) Point-Slope