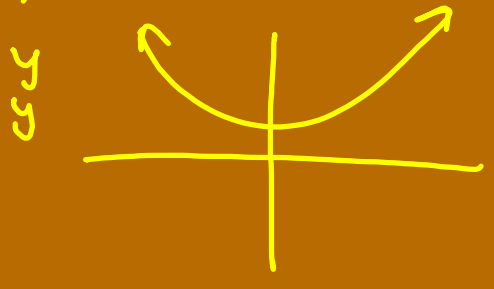
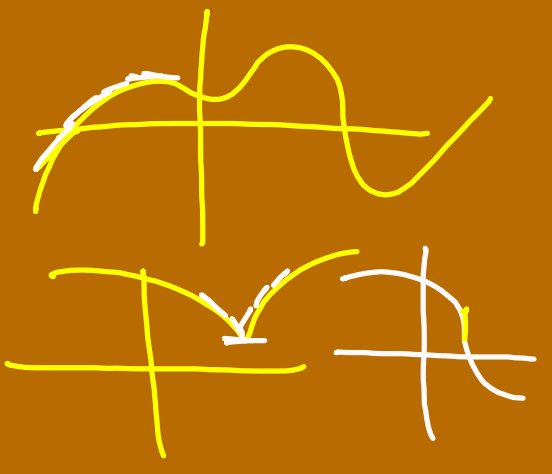
DIFFERENTIABILITY

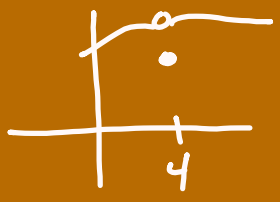
no sharp pts.
no vertical tangent lines
2) no sudden changes in slope
1) continuous





Proving Differentiability

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



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

1) $f(4) = \sqrt{4} = 2$
2) $\lim_{x \to 4^-} 6 - x = 6 - 4 = 2$

$\lim_{x \to 4^+} \sqrt{x} = x^{1/2} = \sqrt{4} = 2$

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

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

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

List

* A derivative represents . . . . .
* 1st definition of deriv $\lim_{x \to a} \frac{f(x)-f(a)}{x-a}$
* and " " " $\lim_{h \to 0} \frac{f(x+h)-f(x)}{h}$
* Write deriv. of 6 trig func.

$f(x) = \cos^8(4x^2 - 3x^7) = (\cos(4x^2 - 3x^7))^8$

$g(x) = \cos(4x^2 - 3x^7)^8$