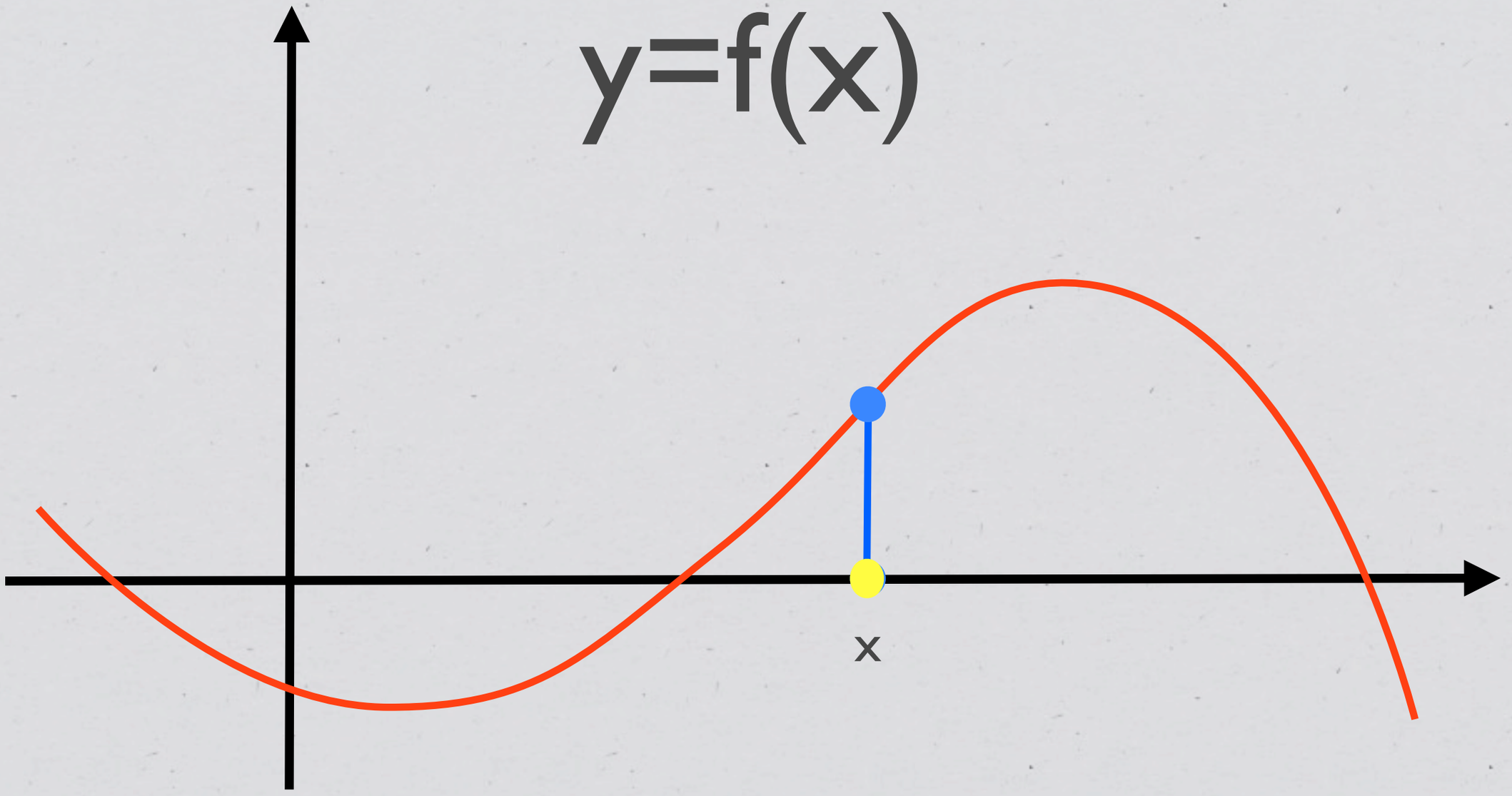
PECHAKUCHA REVIEW FOR FIRST MIDTERM

20×20

Oliver Knill, March 6, 2013, Pecha Kucha Day

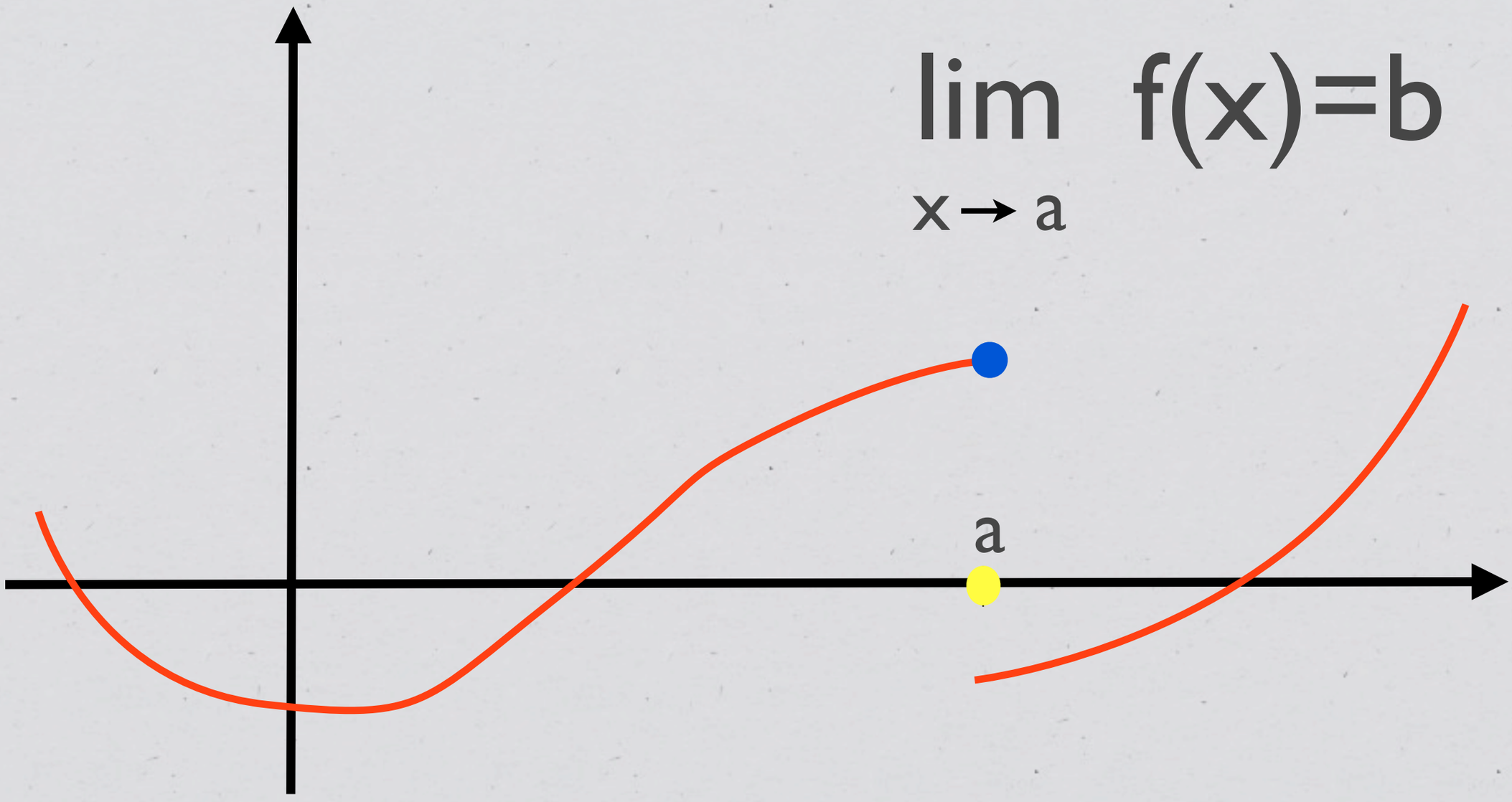
Functions

$$y=f(x)$$

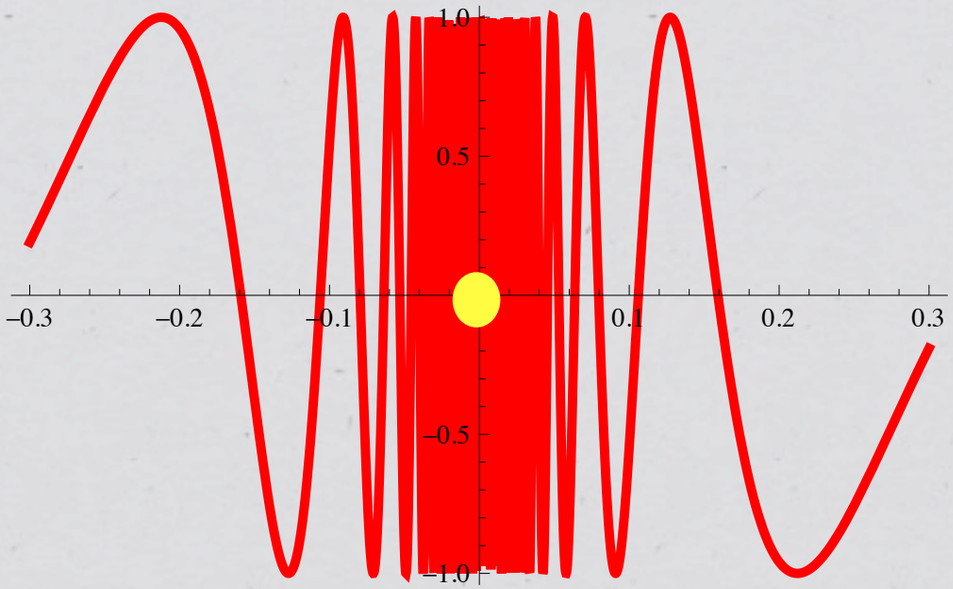


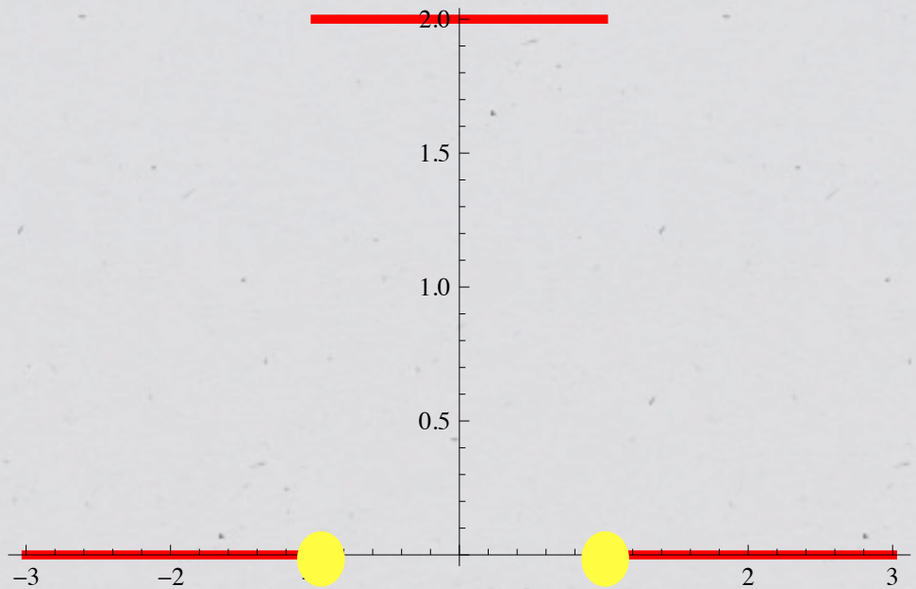
Limits

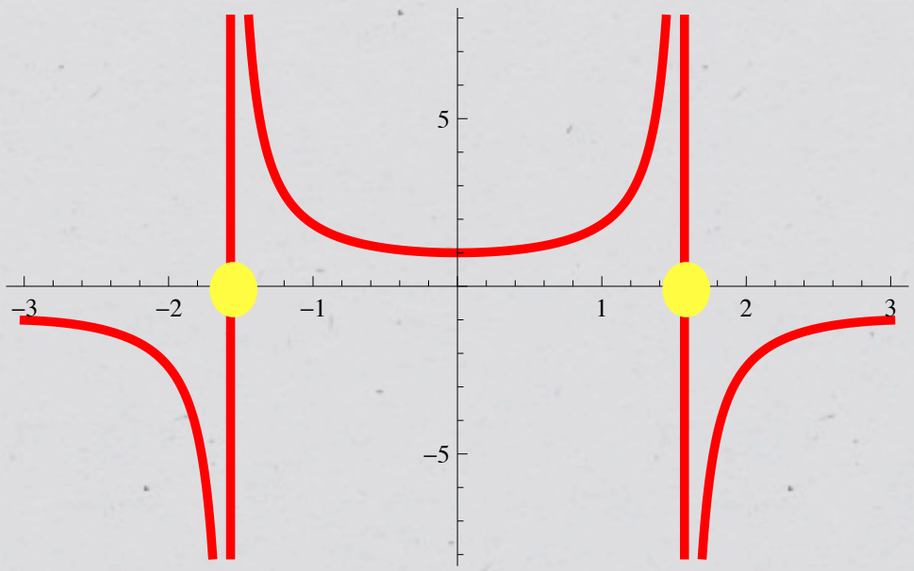
$$\lim_{x \to a} f(x) = b$$

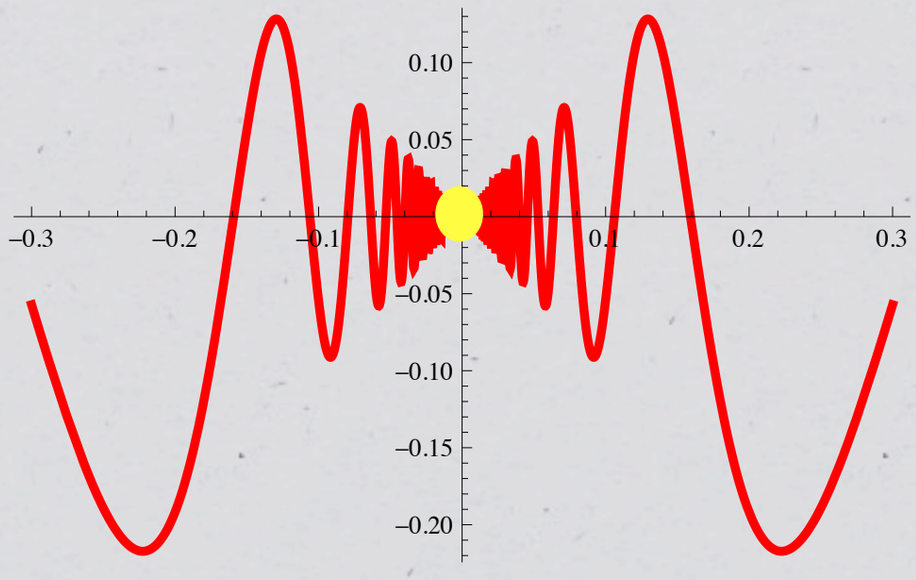


Continuity


1.0
0.5
−0.5
−1.0
−0.3
−0.2
−0.1
0.1
0.2
0.3


2.0
1.5
1.0
0.5
−3
−2
2
3


5
−5
−3
−2
−1
1
2
3


0.10
0.05
−0.05
−0.10
−0.15
−0.20
−0.3
−0.2
−0.1
0.1
0.2
0.3

Derivative

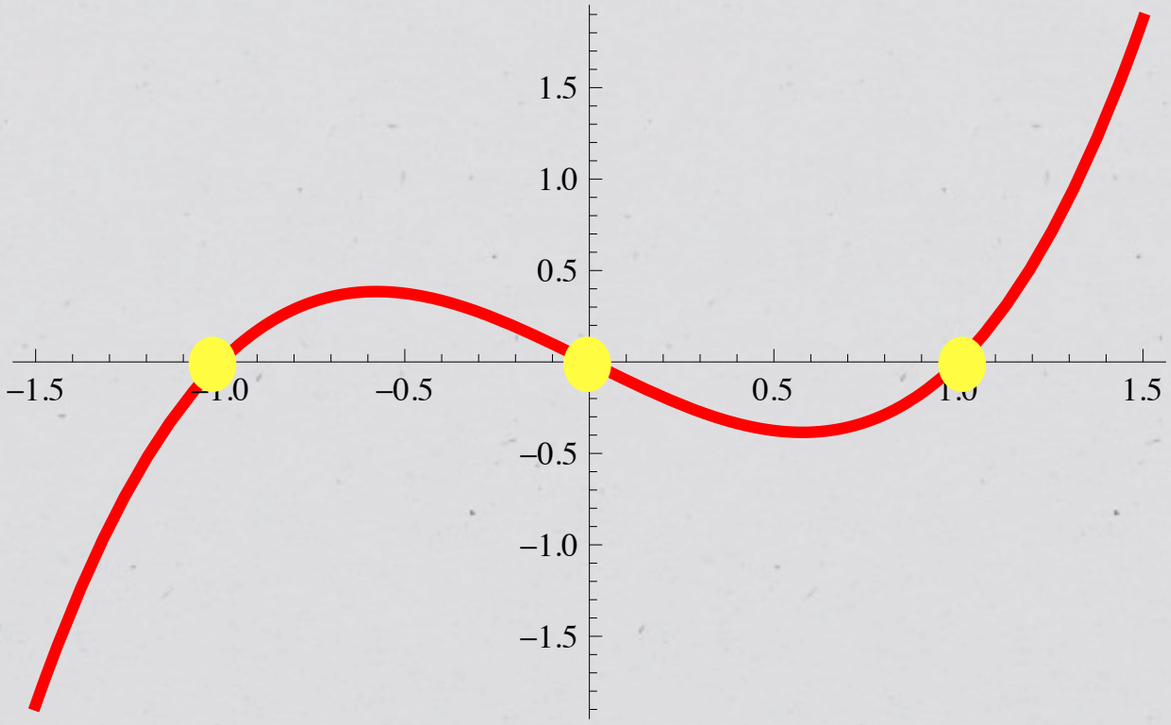
$$f'(x) = \lim_{h \to 0} \frac{f(x+h)-f(x)}{h}$$

$$\frac{d}{dx} x^n = n x^{n-1}$$

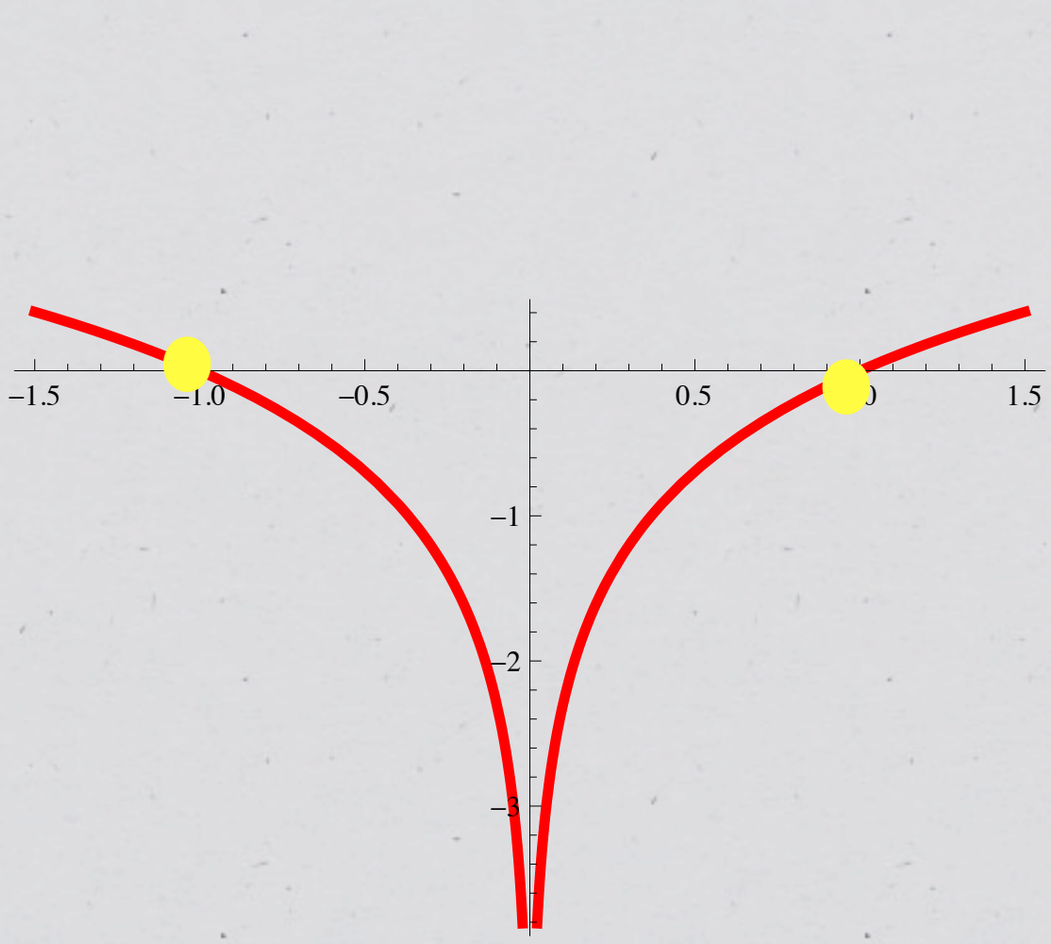
$$\frac{d}{dx} \exp(x) = \exp(x)$$

Roots

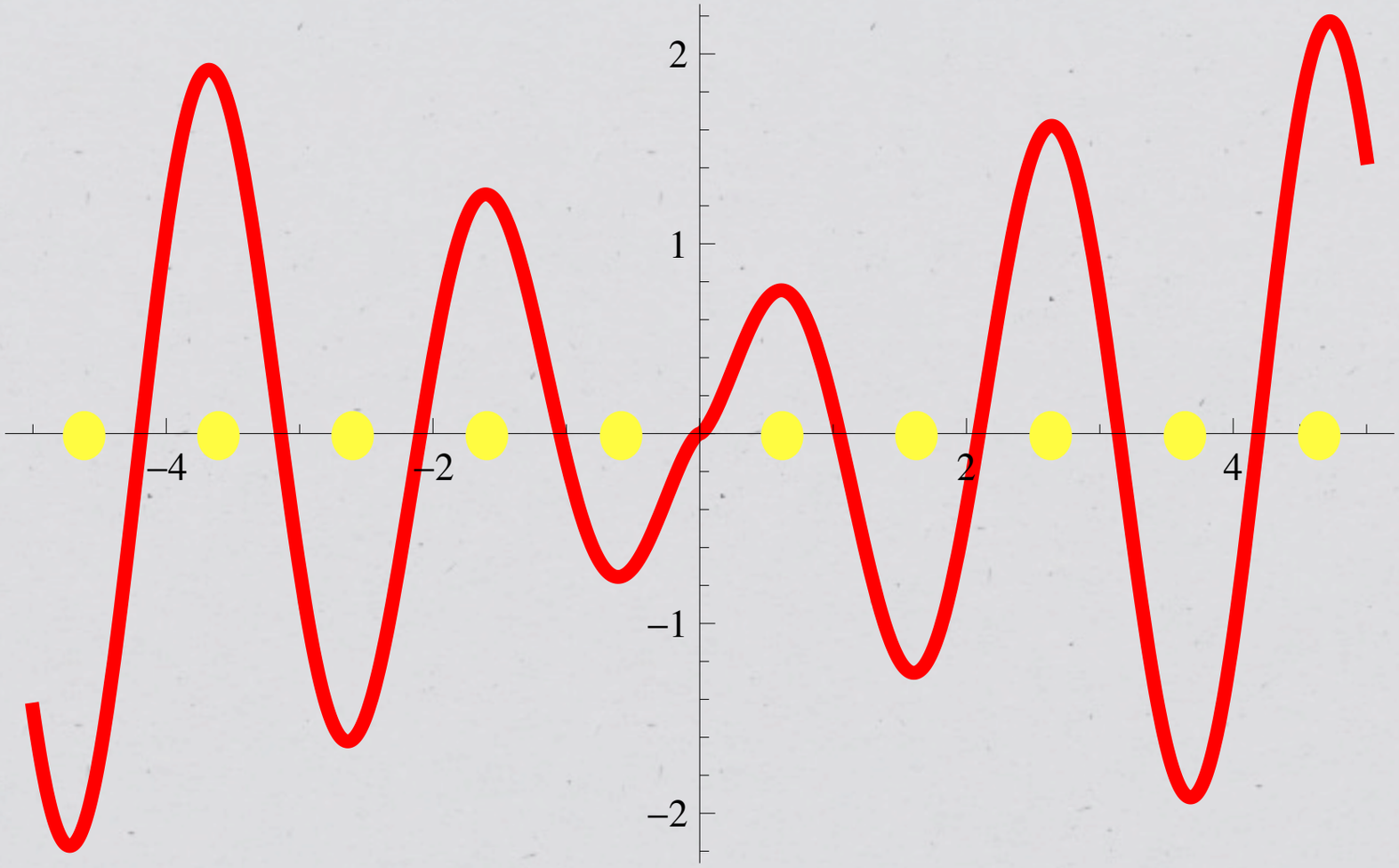
$f(x)=x^3-x$



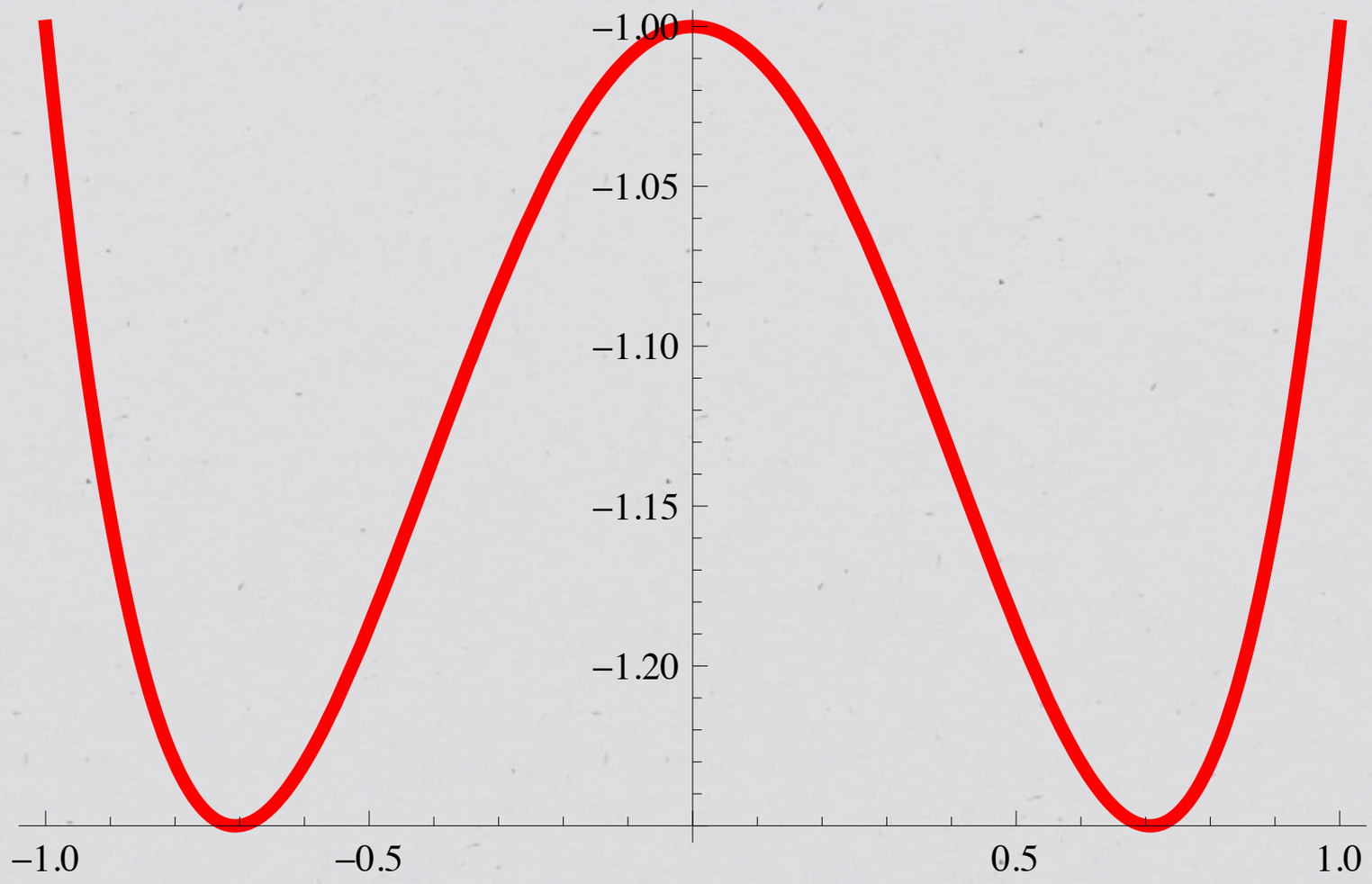
$f(x)=\log|x|$



Critical points



Concavity



Hopital $\frac{0}{0}$ $\frac{\infty}{\infty}$

$$\lim_{h \to a} \frac{f(x)}{g(x)} = \lim_{h \to a} \frac{f'(x)}{g'(x)}$$

$$\lim_{h \to 0} \frac{\sin(x)}{x} = \lim_{h \to 0} \frac{\cos(x)}{1} = 1$$

$$\lim_{h \to 0} \frac{\log(x)}{x} = \lim_{h \to 0} \frac{1/x}{-1/x^2} = 0$$

Product rule

$$(f\ g)'(x) = f'(x)\ g(x) + f(x)\ g'(x)$$

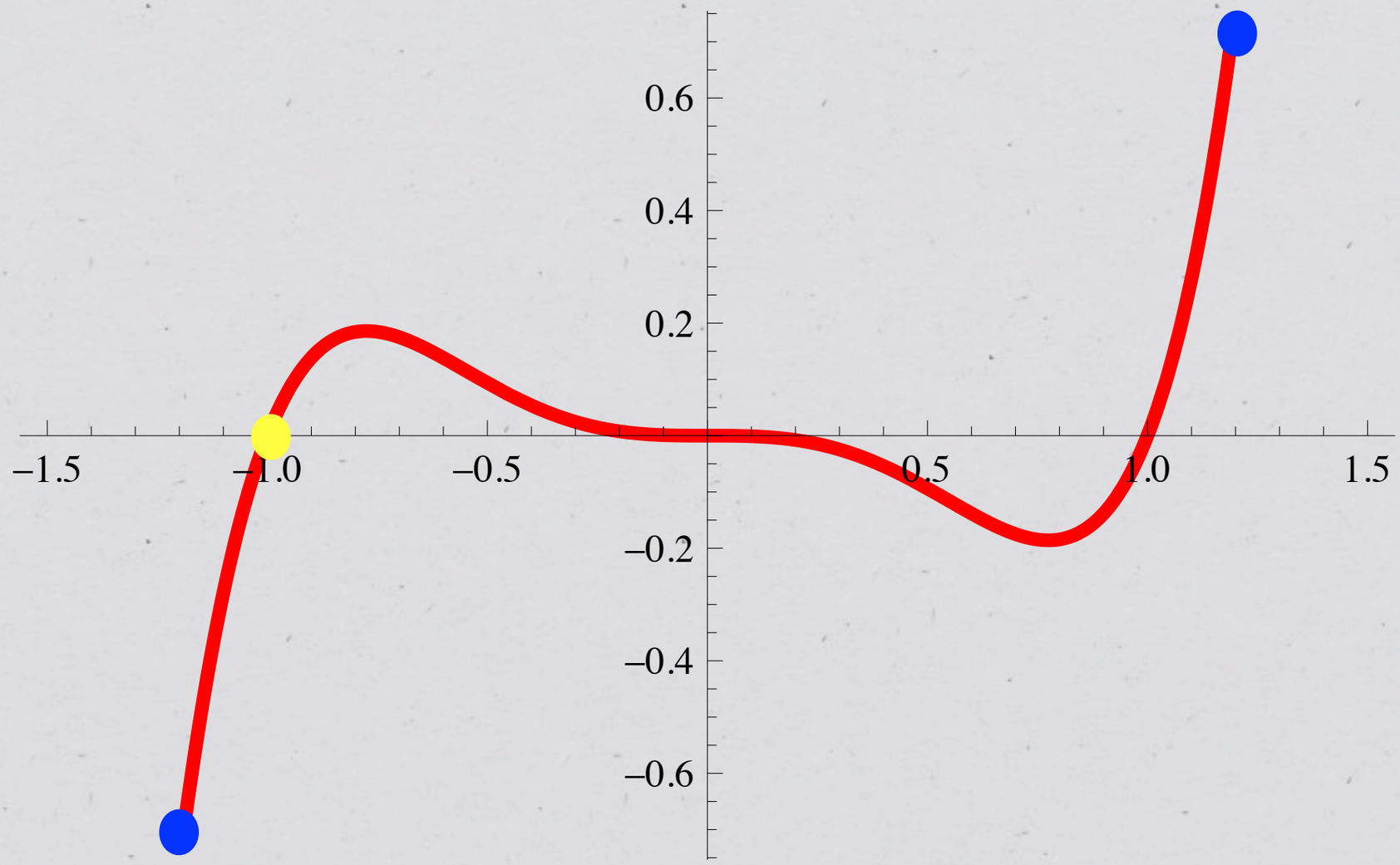
Quotient rule

$$(f/\ g)'(x) = \frac{f'(x)\ g(x) - f(x)\ g'(x)}{g(x)^2}$$

Chain rule

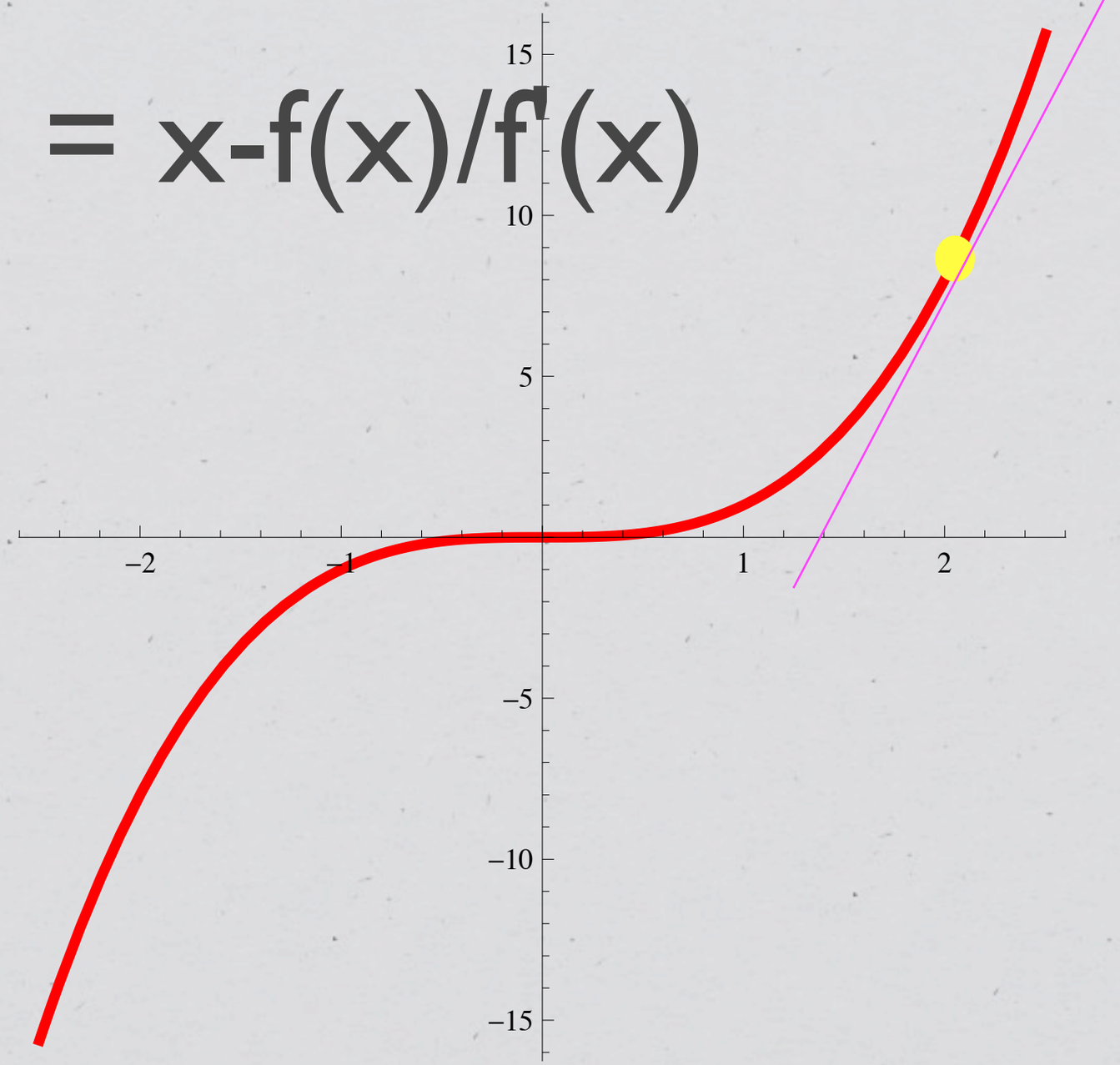
$$f(g(x))' = f'(g(x))\ g'(x)$$

Intermediate value theorem



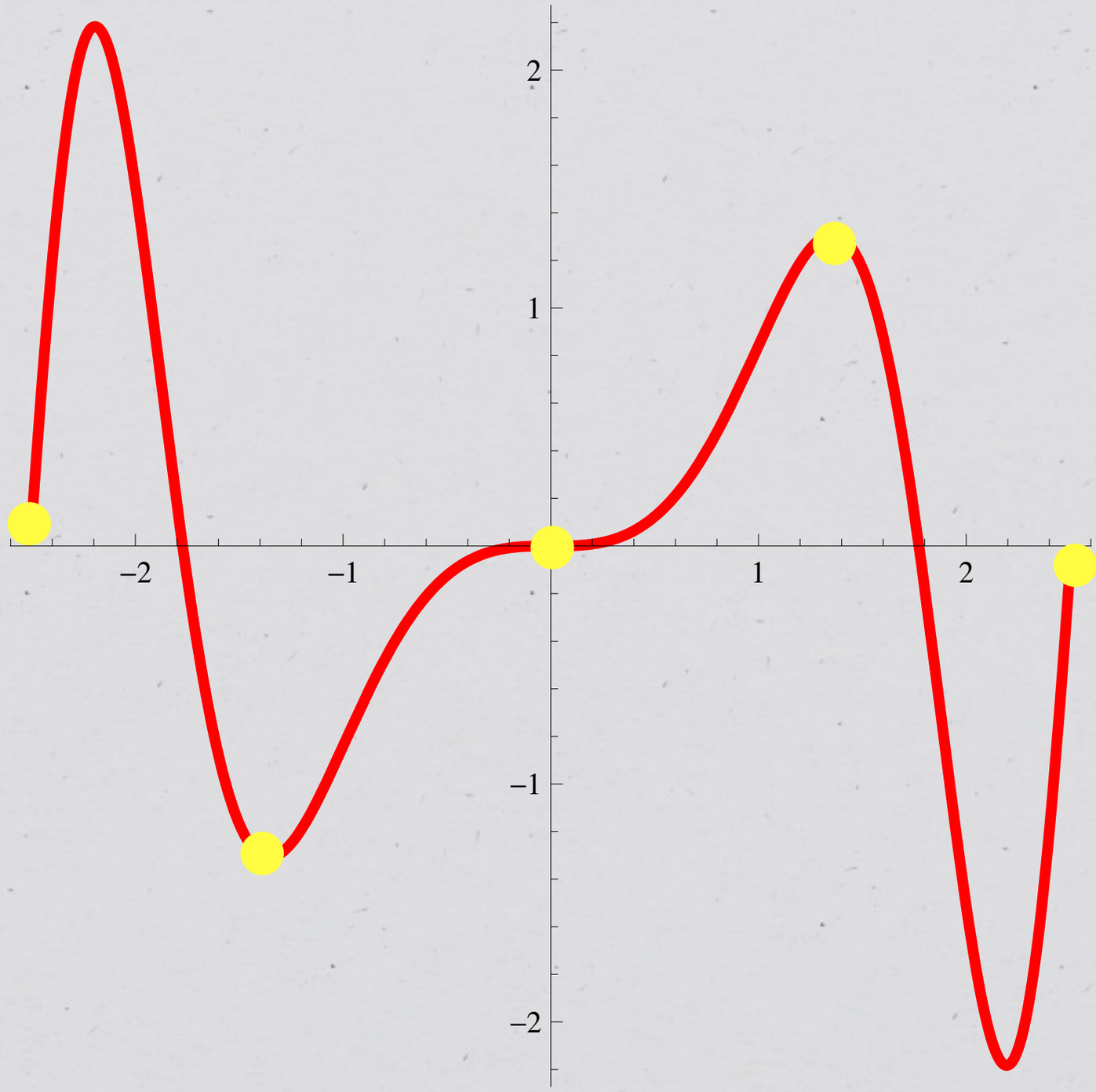
Newton Method

$$T(x) = x - f(x)/f'(x)$$



Second Derivative test

Global Extrema



Deriving the Inverse

$$\cos(\arccos(x)) = x$$

$$\sin(\arccos(x))\ \arccos'(x) = 1$$

$$\arccos'(x) = 1/\sqrt{1-\cos^2(\arccos(x))}$$

Logs

$$\log(a\ b) = \log(a) + \log(b)$$

$$\log(a^b) = b\ \log(a)$$

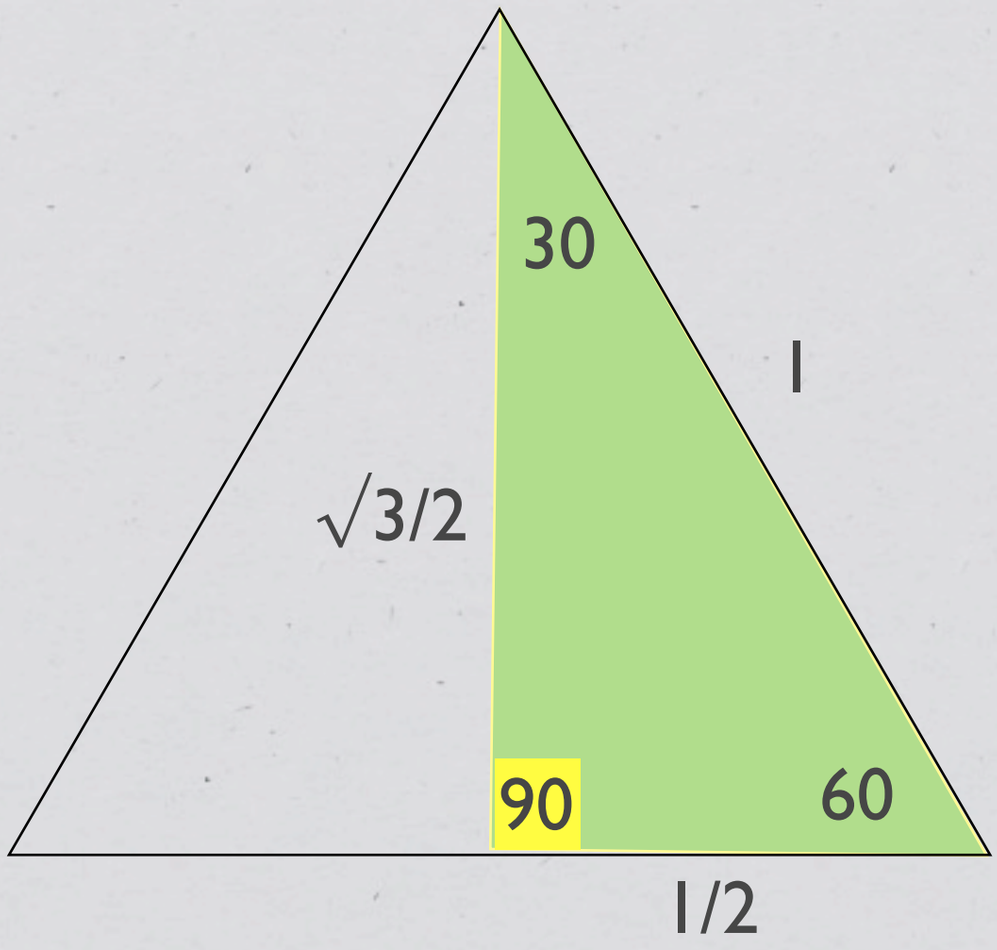
$$\log(a/b) = \log(a) - \log(b)$$

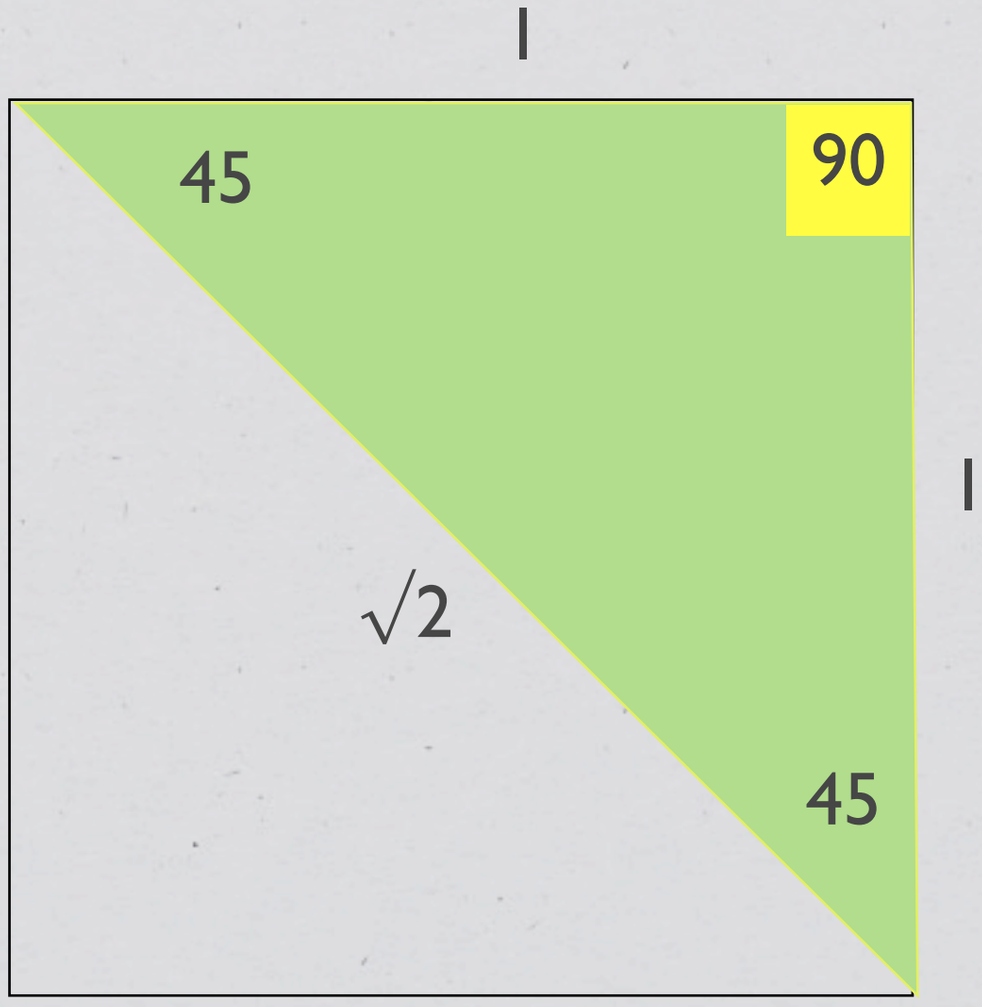
$$\log(1) = 0$$

$$\exp(\log(x)) = x$$

Trig

$$\cos^2(x) + \sin^2(x) = 1$$





Exp

$$\exp(a + b) = \exp(a) * \exp(b)$$

$$a^b = \exp(b \log(a))$$

$$a^{b^c} = a^{bc}$$