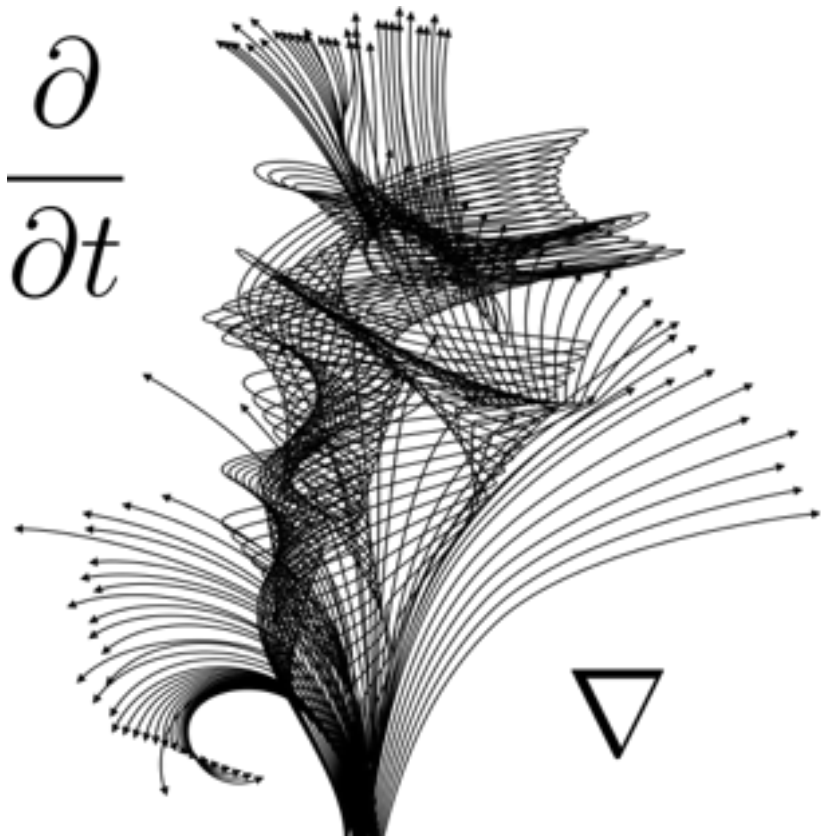
Differential Calculus with Applications to Life Sciences

Math 102:105

Pooya Ronagh

Agenda for today:

- Inverse trig functions
- Related rates of trig functions



Derivative of trig functions

What is the derivative of cot(x)?

(A) csc(x)cot(x)

(B) -csc(x)cot(x)

(C) $\csc^2(x)$

(D) $-\csc^2(x)$

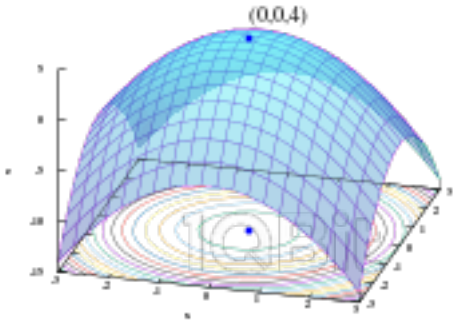
(E) $\sec^2(x)$

$$\frac{d}{dx}\sin(x) = \cos(x)$$

$$\frac{d}{dx}\cos(x) = -\sin(x)$$

$$\frac{d}{dx}\tan(x) = \sec^2(x)$$

$$\frac{d}{dx}\cot(x) = -\csc^2(x)$$



Periods of trig functions

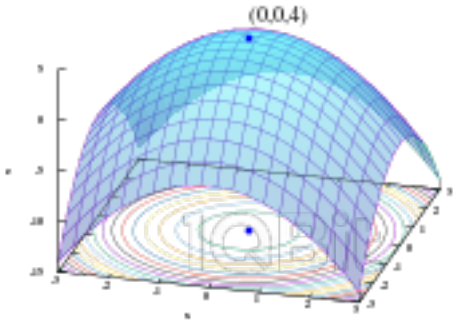
The **period** of the function y = f(x) is the smallest number T for which

$$f(t + T) = f(t)$$

for all values of t.

Example: What is the period of f(x) = 1 + 2 sin (3x - 1)?

Question: What is the **phase-shift** of this function?



Amplitude of trig functions

The **amplitude** of a trig function y = f(x) is defined as

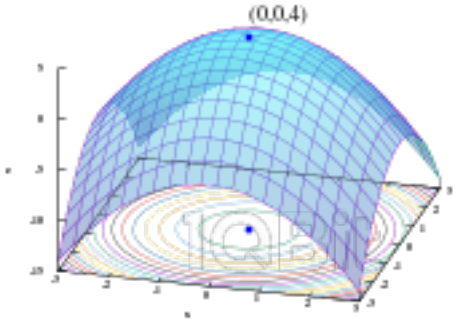
$$(\max f - \min f)/2.$$

Example: What is the amplitude of f(x) = 1 + 2 sin (3x - 1)?

The **midline** (or average) of a trig function y = f(x) is defined as

$$(\max f + \min f)/2.$$

Example: What is the midline of f(x) = 1 + 2 sin (3x - 1)?



Example

What is the period and amplitude of h(t) = 8 - 6sin(4t)?

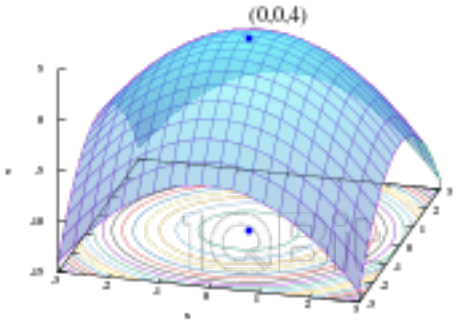
(A) T=4, A= 14

(B) T=1, A= 8

(C) T=1/4, A= 12

(D) T=2π, A= -6

(E) T=π/2, A= 6



Related rates + trig functions

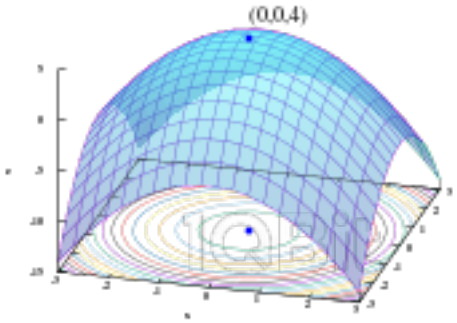
If the height of an isosceles triangle with base 2m changes at a rate h’=3 m/s, how quickly is the angle opposite the base changing when h= √3 m?

(A) -3/2

(B) -1/2

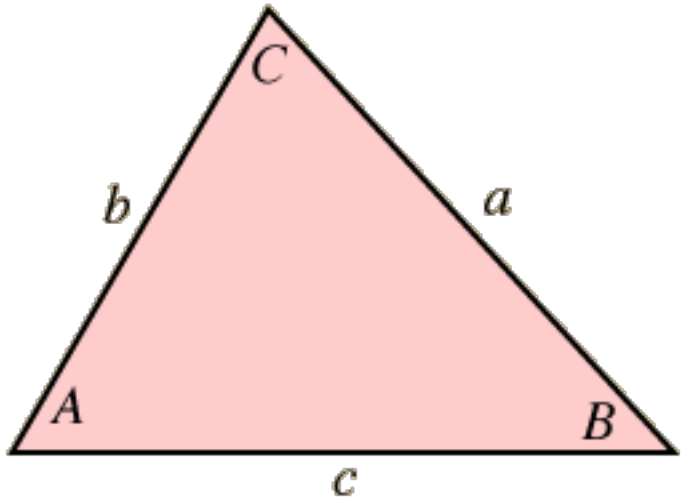
(C) 1/2

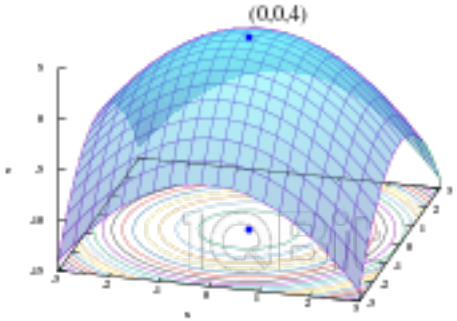
(D) 3/2



Cosine law

$$c^2 = a^2 + b^2 - 2ab\cos C$$





Inverse trig functions

Which of the following is false?

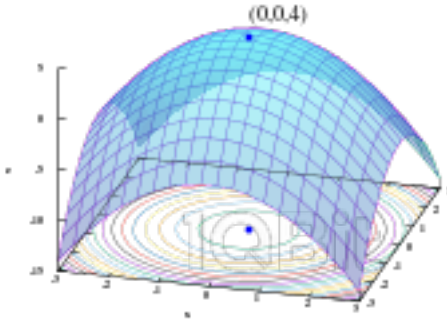
(A) $\cos(\arctan(\sqrt{3})) = 1/2$

(B) $\sin(\arccos(1/2)) = \sqrt{3}/2$

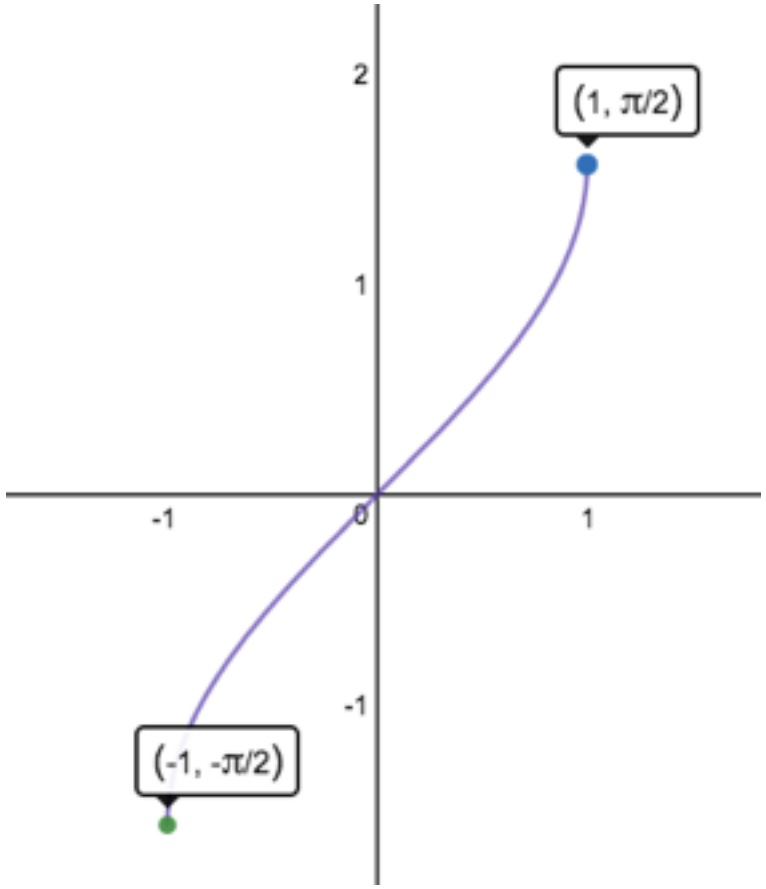
(C) $\arctan(1) = \pi/4$

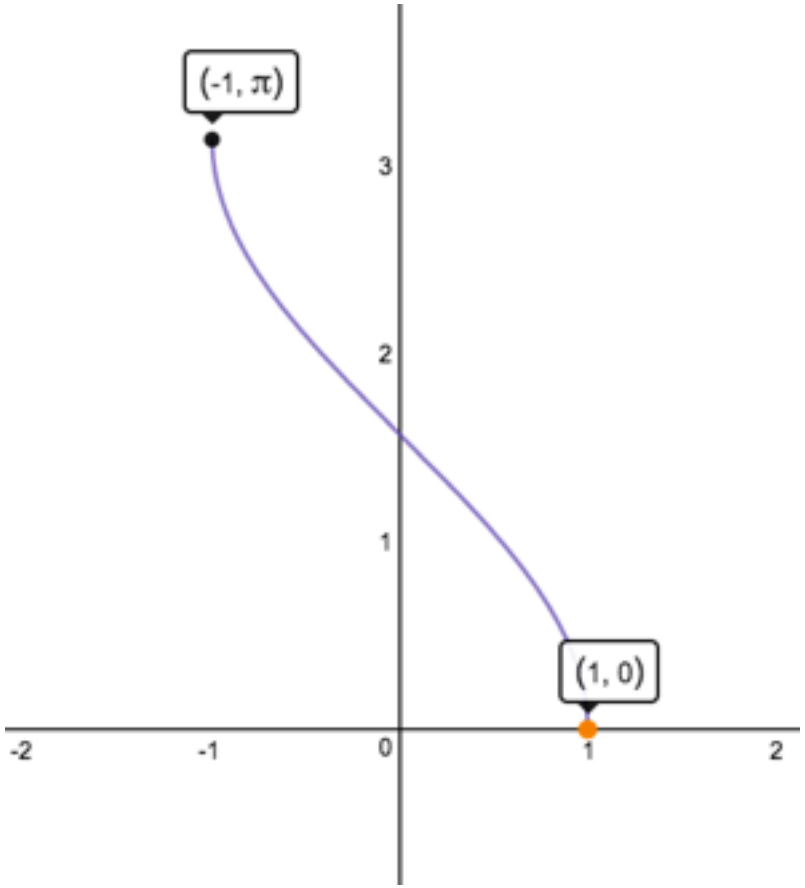
(D) $\arcsin(1/2) = \pi/3$

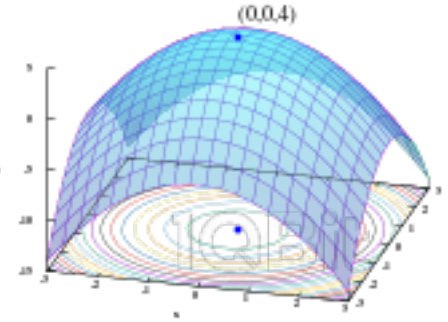
(E) $\sin(3\pi/2) = -1$



Domain and range of inverse trig functions







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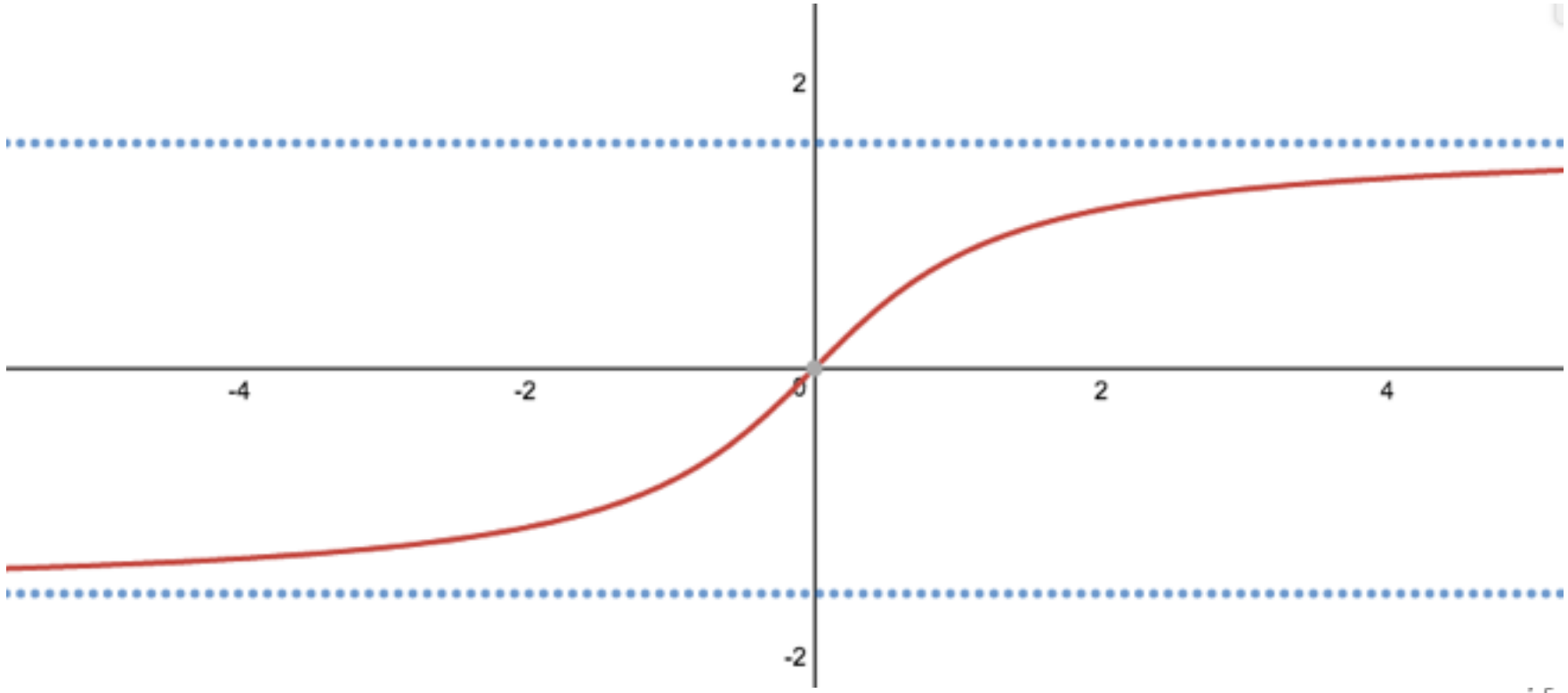

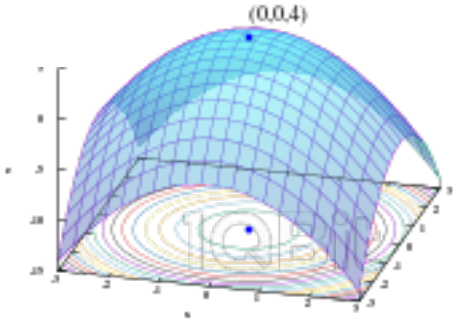

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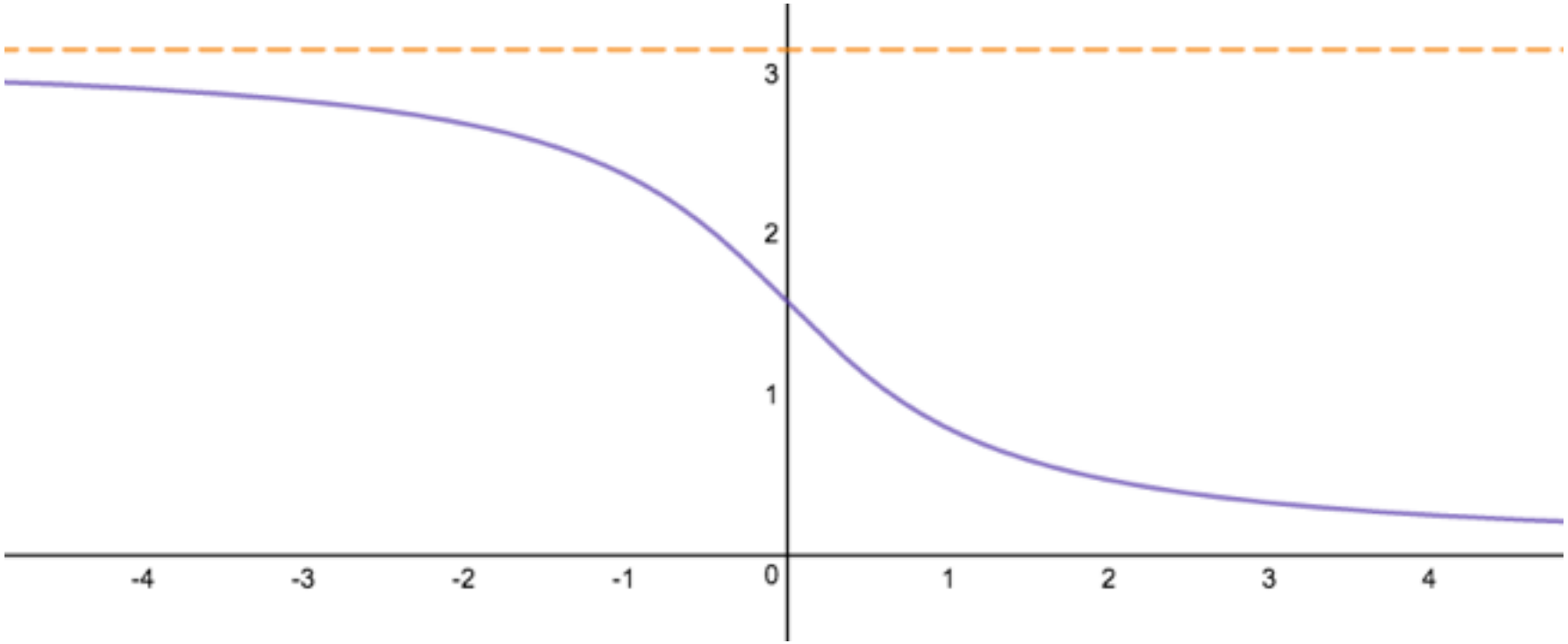

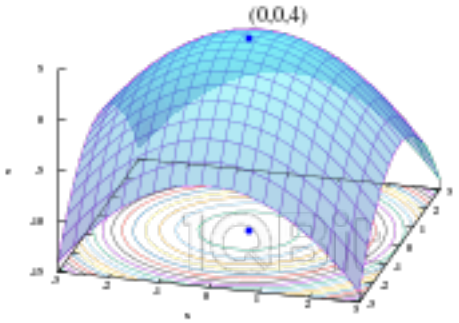

Next time: final period office hours

Nov 30	PL13.2
Dec 1	WW 12
Dec 8	WW 13