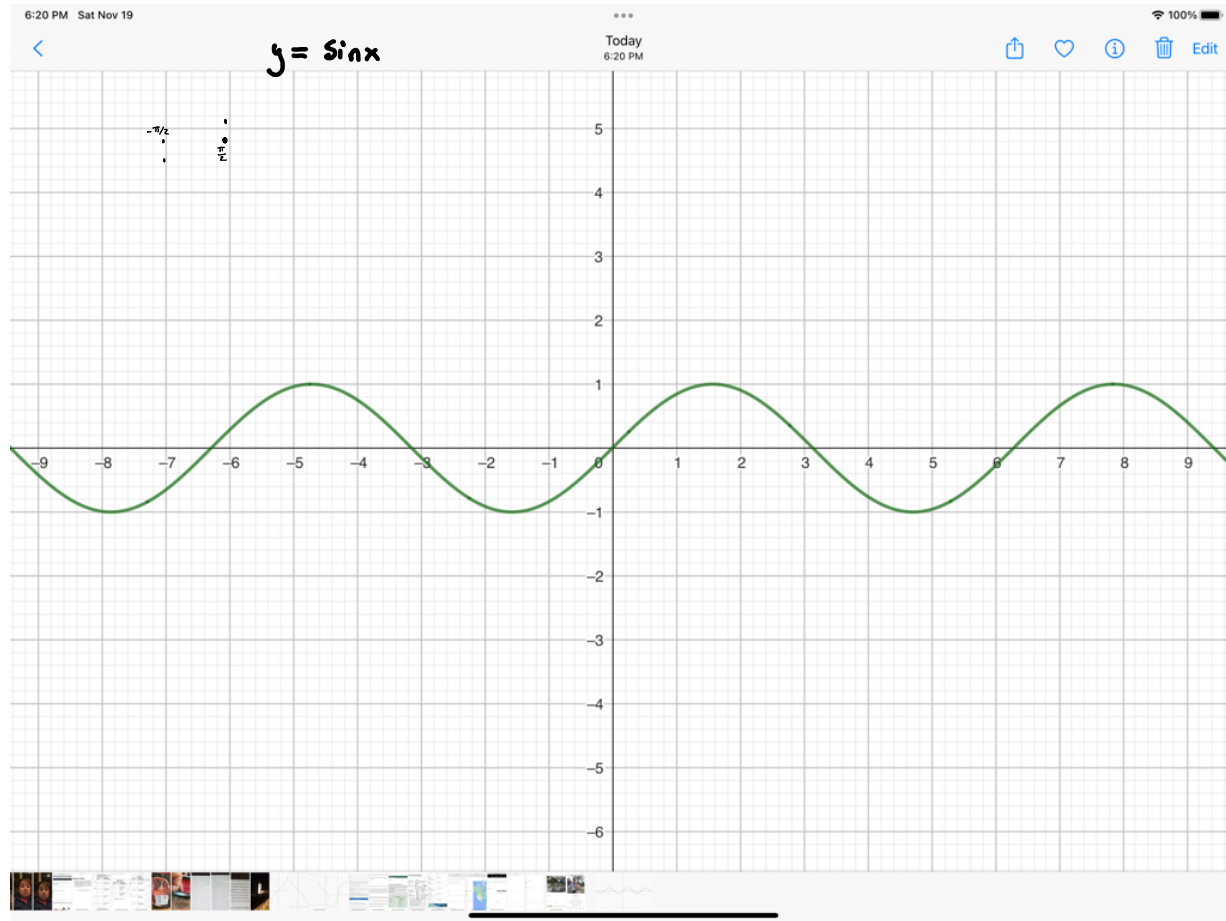# Lesson 24

Read Chapter 20

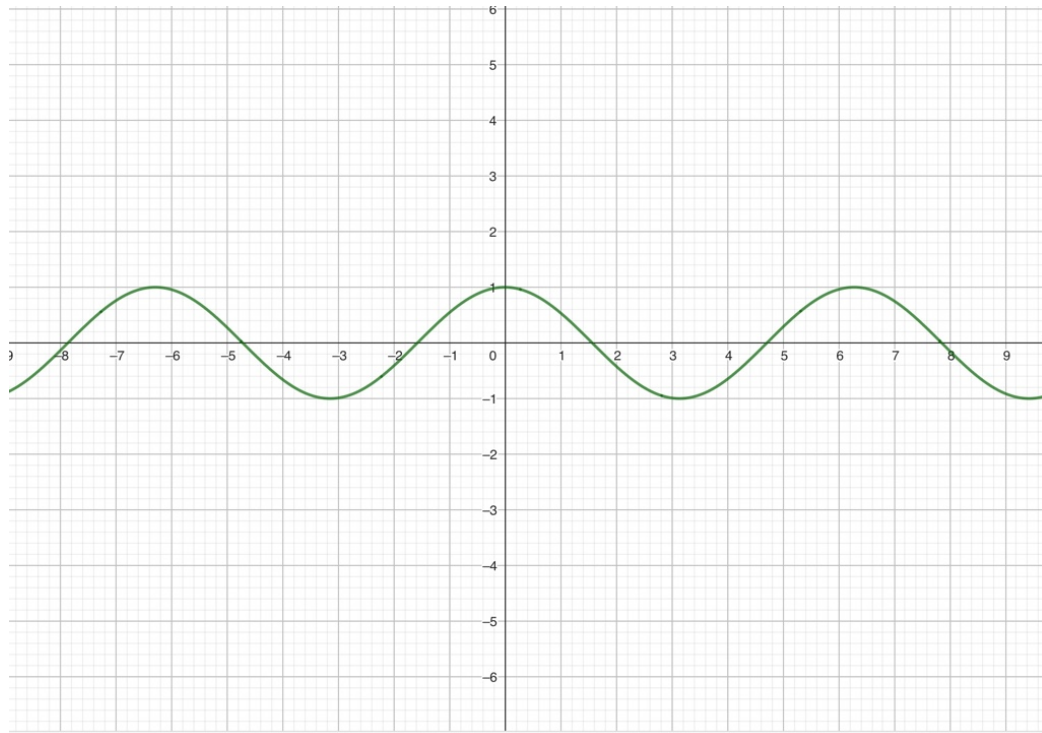Inverse trigonometric functions

Midterm 3 review

1. University A had 20,000 students in 2000; enrollment at University A increases 2% every 10 years. In 2015 University B had 15,000 students; the number of students enrolled in University B triples every 100 years. When will University B have twice as many students as University A ? Give your answer as a year , ex: 2027.
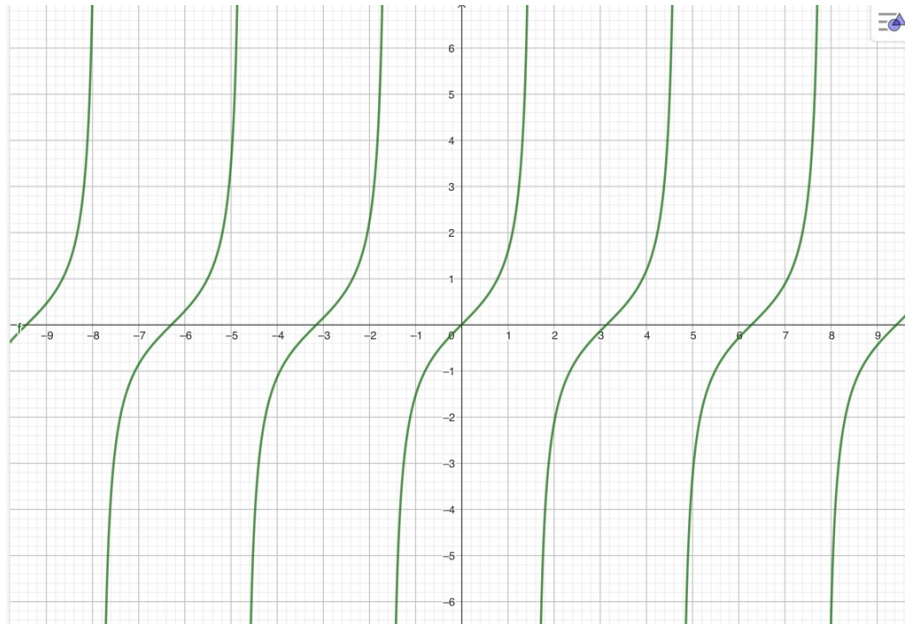
.

2

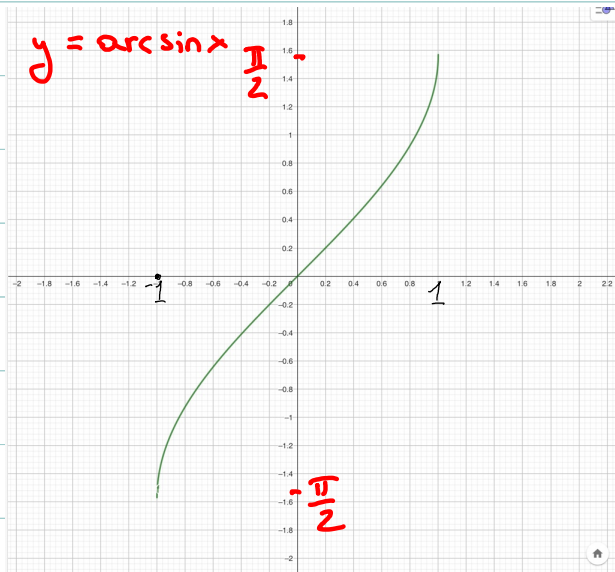arcsin(x)   is the inverse of   sin x   restricted to $[-\frac{\pi}{2} \quad \frac{\pi}{2}]$

y = sin x

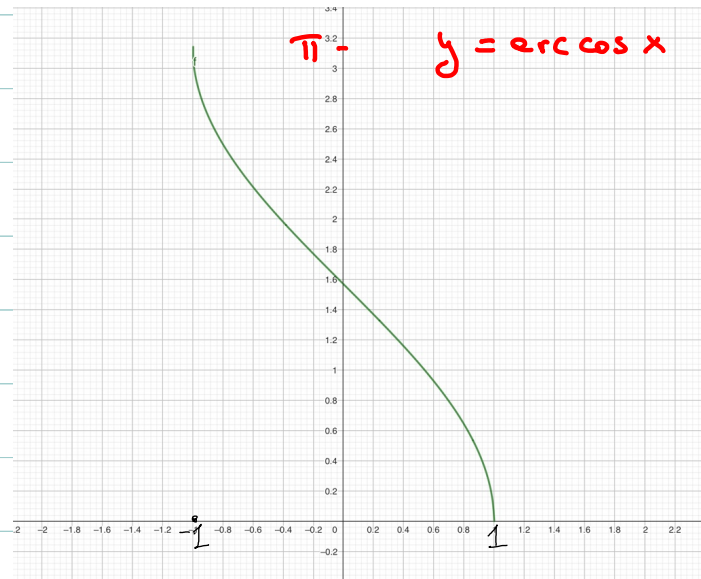# arccos(x)   is the inverse of cosx restricted to [0, π]

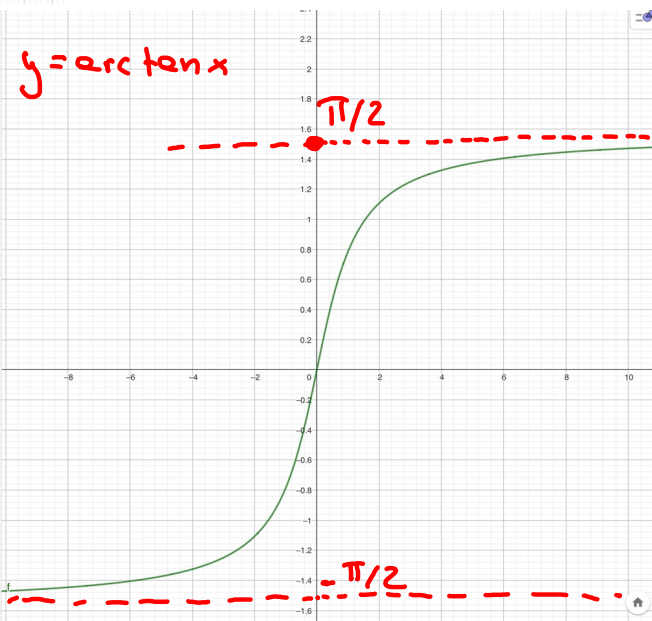# arctan(x) is the inverse of tan x restricted to $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$

$y = \arcsin x$

$\dfrac{\pi}{2}$

$-\dfrac{\pi}{2}$

Domain $[-1, 1]$
Range $[-\dfrac{\pi}{2}, \dfrac{\pi}{2}]$

$y = \arccos x$

π

Domain $[-1, 1]$
Range $[0, \pi]$

$y = \arctan x$
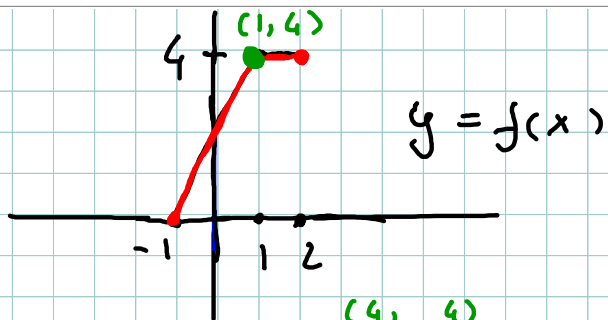
$\pi/2$

$-\pi/2$

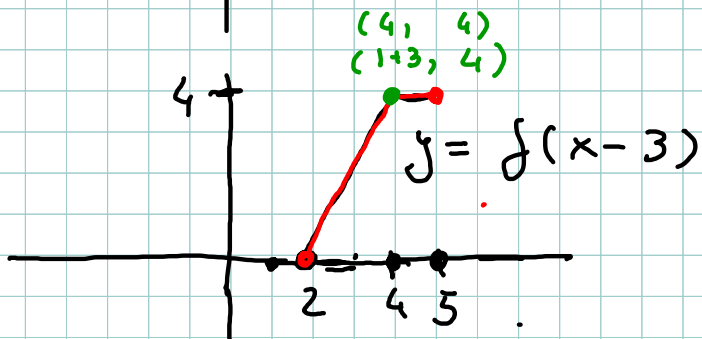Domain $(-\infty, +\infty)$
Range $(-\dfrac{\pi}{2}, \dfrac{\pi}{2})$

NAME (First,Last)   .

Suppose $y = f(x)$ is a function with domain $-1 \le x \le 2$ and range $0 \le y \le 4$ and $g(x) = -5f(-\frac{x}{2} - 3) + 1$.

(a) List the graphical operations, in a correct order, needed to transform the graph of f into the graph of g. (By graphical operations I mean shifts, reflections and scalings. Be precise, for example say something like *horizontal shift to the right of 7 units*, or *reflection around the x axis* or *vertical scaling of a factor $c = 7$*).

(b) Suppose you know that the point $P = (1, 4)$ belongs to the graph of f. The graphical operations you listed above move P into some point Q on the graph of g. Find the coordinates of Q.
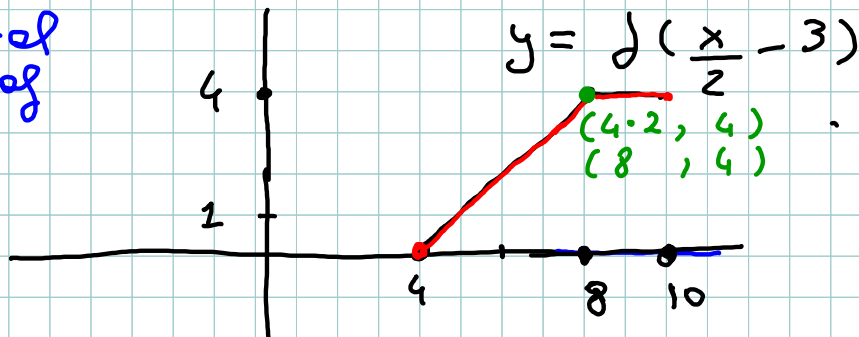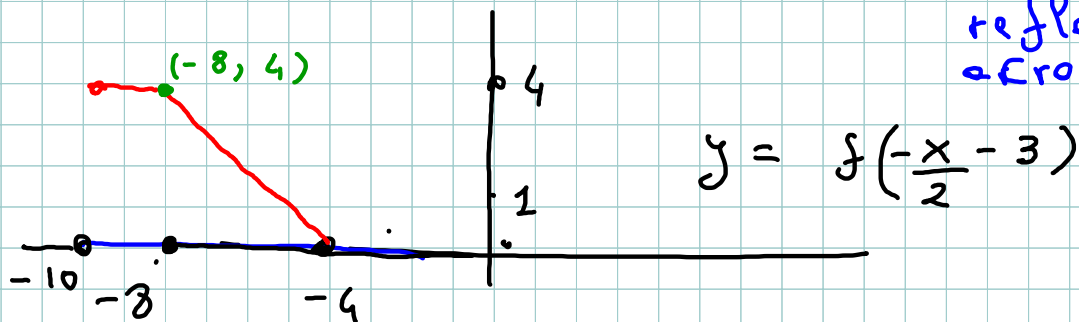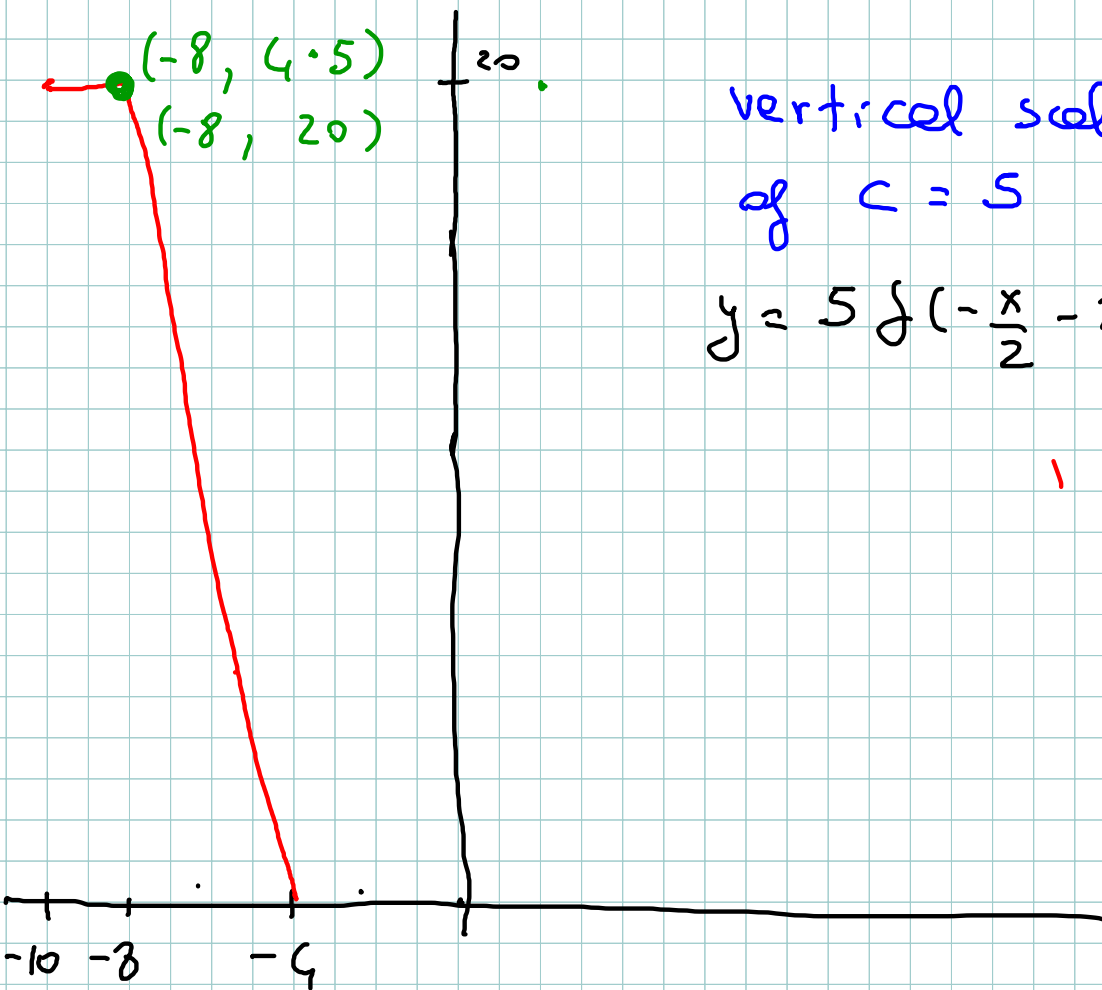
(c) Find the domain and range of g.

.

3

(1,4)

4

$y = f(x)$

-1   1 2

(4, 4)
(1+3, 4)

4

$y = f(x-3)$

Shift right
3 units

2   4 5

horizontal
scaling of

C = 2

$y = f\left(\dfrac{x}{2} - 3\right)$

4

1

(4·2, 4)
(8 , 4)

4   8   10

reflection
across y axis

(-8, 4)

4

$y = f\left(-\dfrac{x}{2} - 3\right)$

1

-10   -8   -4

(-8, 4·5)
(-8, 20)

20

vertical scaling
of $c = 5$

$$y = 5f\left(-\frac{x}{2} - 3\right)$$

-10 -8 -6

reflection across x axis

$$y = -5 f\left(-\frac{x}{2} - 3\right)$$

-20

(-8, -20)

-1n -8 -4

-10 -8 -4 1

Shift up 1 unit

$$y = -5 f\left(-\dfrac{x}{2} - 3\right) + 1$$

-19

(-8, -20 +1)
(-8, -19)

Solve $\sin(x) = \dfrac{1}{2}$