Lesson 17

Finish Chapter 13. Domain,Range

Read Chapter 15

Angles. Arclength, Area of Wedges

Skip Ch 14

How to graph $a\,f(bx+c)+d$

$bx = \frac{x}{\frac{1}{b}}$

1. Graph $y = f(x)$
   Horizontally :
2. Shift $|c|$ units, left if c is positive, right if c is negative .
3. Scale horizontally of a factor $\frac{1}{|b|}$ (compression if $|b| > 1$, expansion if $|b| < 1$)
4. Reflect across y axis if b is negative . Skip this step if b is positive.
   Vertically:
5. Scale by a factor of $|a|$ (compression if $|a| < 1$, expansion if $|a| > 1$)
6. Reflect across x axis if a is negative . Skip this step if a is positive.
7. Shift $|d|$ units, up if c is positive, down if c is negative .

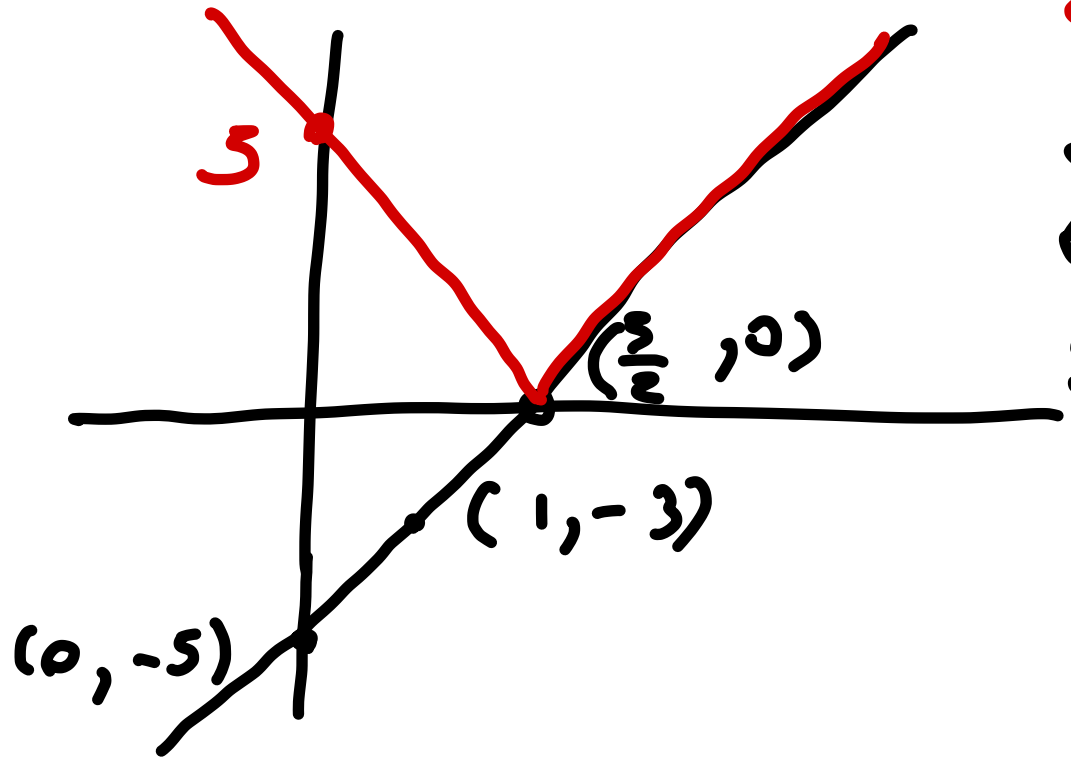
Note: the order is important.

Sketch the graph of $g(x) = 3|2x - 5| + 1$

1) Start with $y = |x|$

. . . .

OR



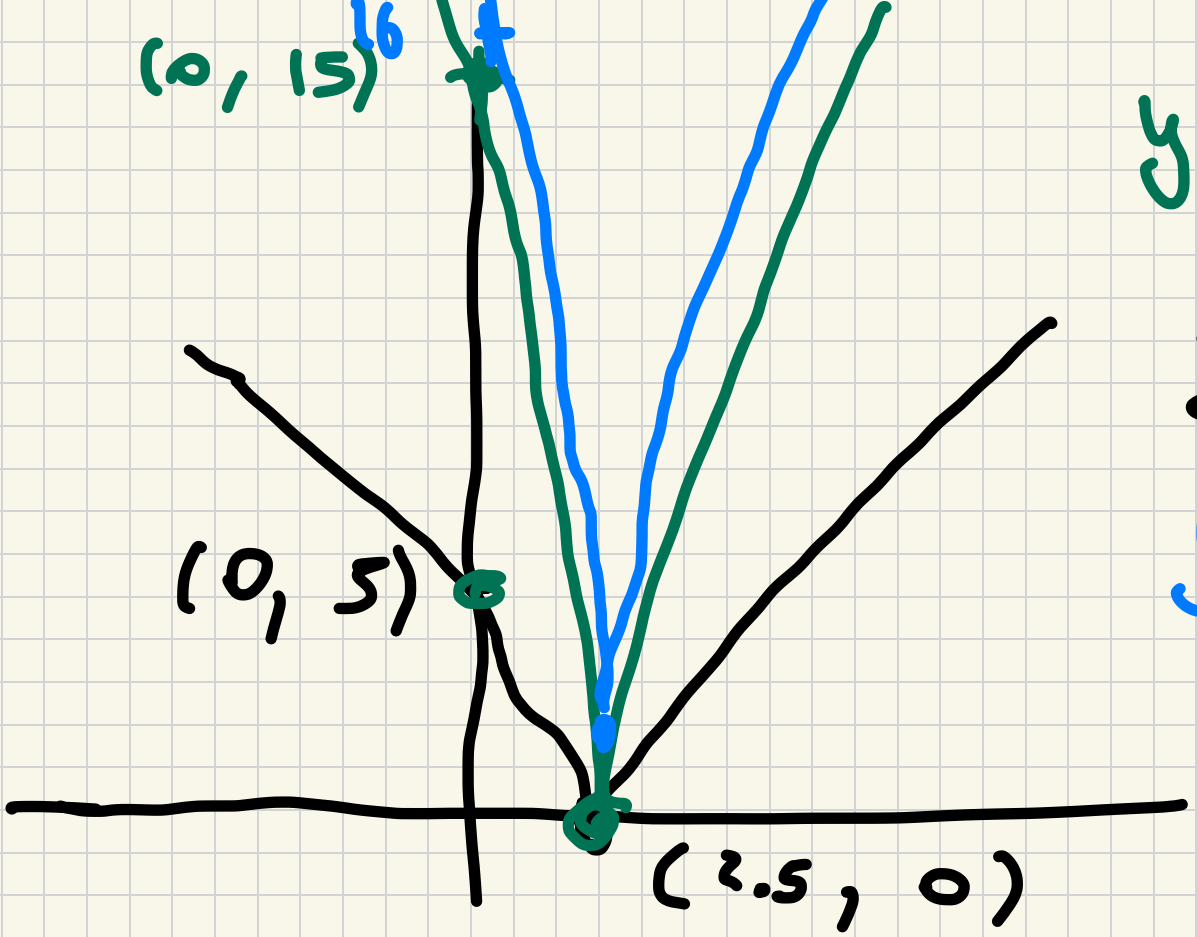
$y = |2x - 5|$

$y = 2x - 5$

$0 = 2x - 5$

$5 = 2x$

Goal $y = 3|2x - 5| + 1$



$y = 3|2x-5|$

$y = |2x-5|$

$y = 3|2x-5| + 1$

previously: $af(bx+c)+d$

How to graph $af(b(x+c))+d$.

$af(bx+bc)+d$

$A\sin\left(\frac{2\pi}{B}(x-C)\right)+D$

1. Graph $y=f(x)$
   Horizontally:
2. Scale horizontally of a factor $\frac{1}{|b|}$. .(compression if $|b|>1$, expansion if $|b|<1$)
3. Reflect across y axis if b is negative . Skip this step if b is positive.
4. Shift $|c|$ units, left if c is positive, right if c is negative .
   Vertically:
5. Scale by a factor of $|a|$ (compression if $|a|<1$, expansion if $|a|>1$)
6. Reflect across x axis if a is negative . Skip this step if a is positive.
7. Shift $|d|$ units, up if c is positive, down if c is negative .

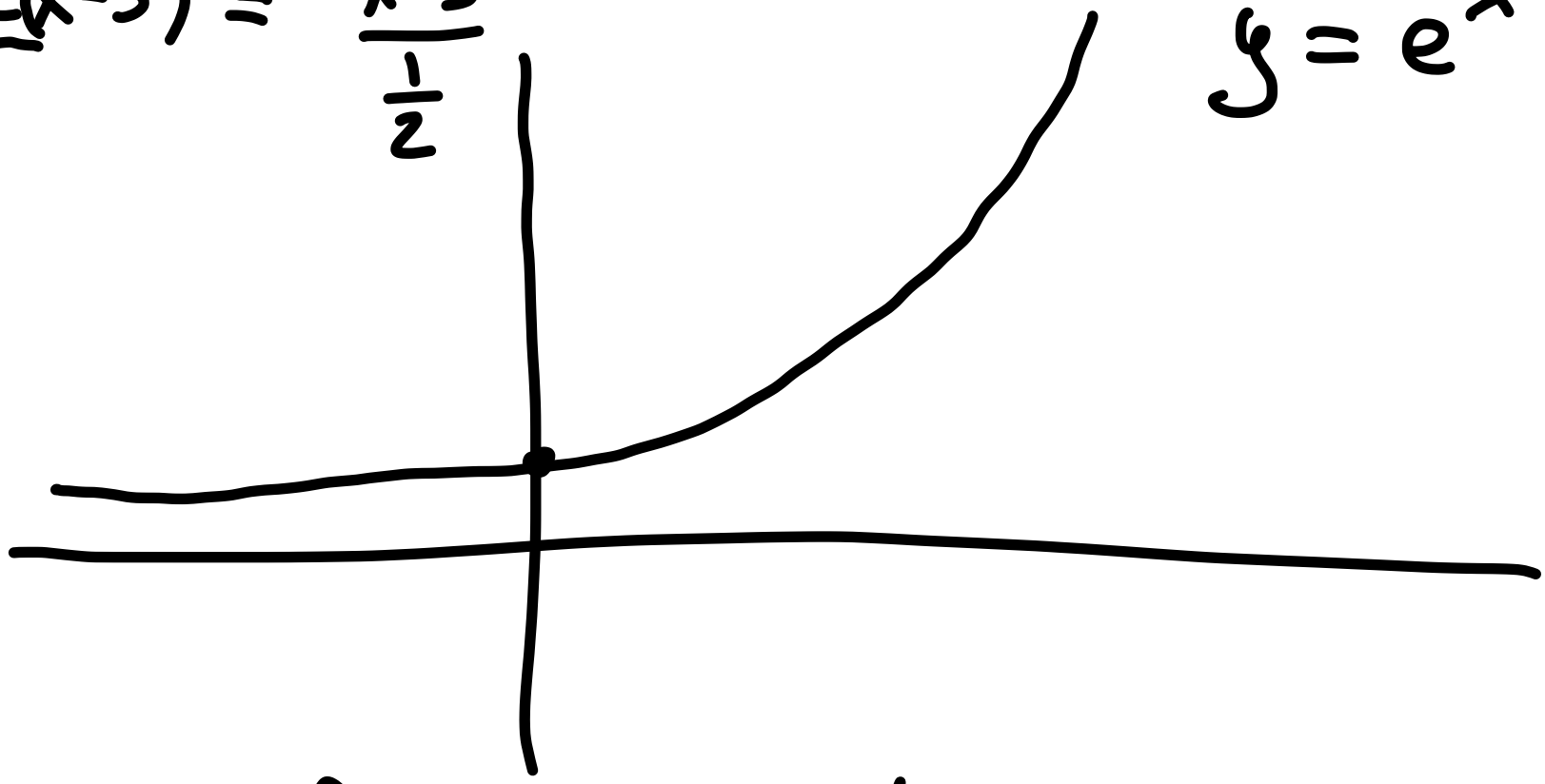
Note: the order is important.

$f(x) \to f\left(\frac{x}{\frac{1}{|b|}}\right) = f(|b|x) \Rightarrow$

→ f(bx) → f(b(x+c))

Sketch the graph of $g(x) = 3e^{2(x-5)} + 1$

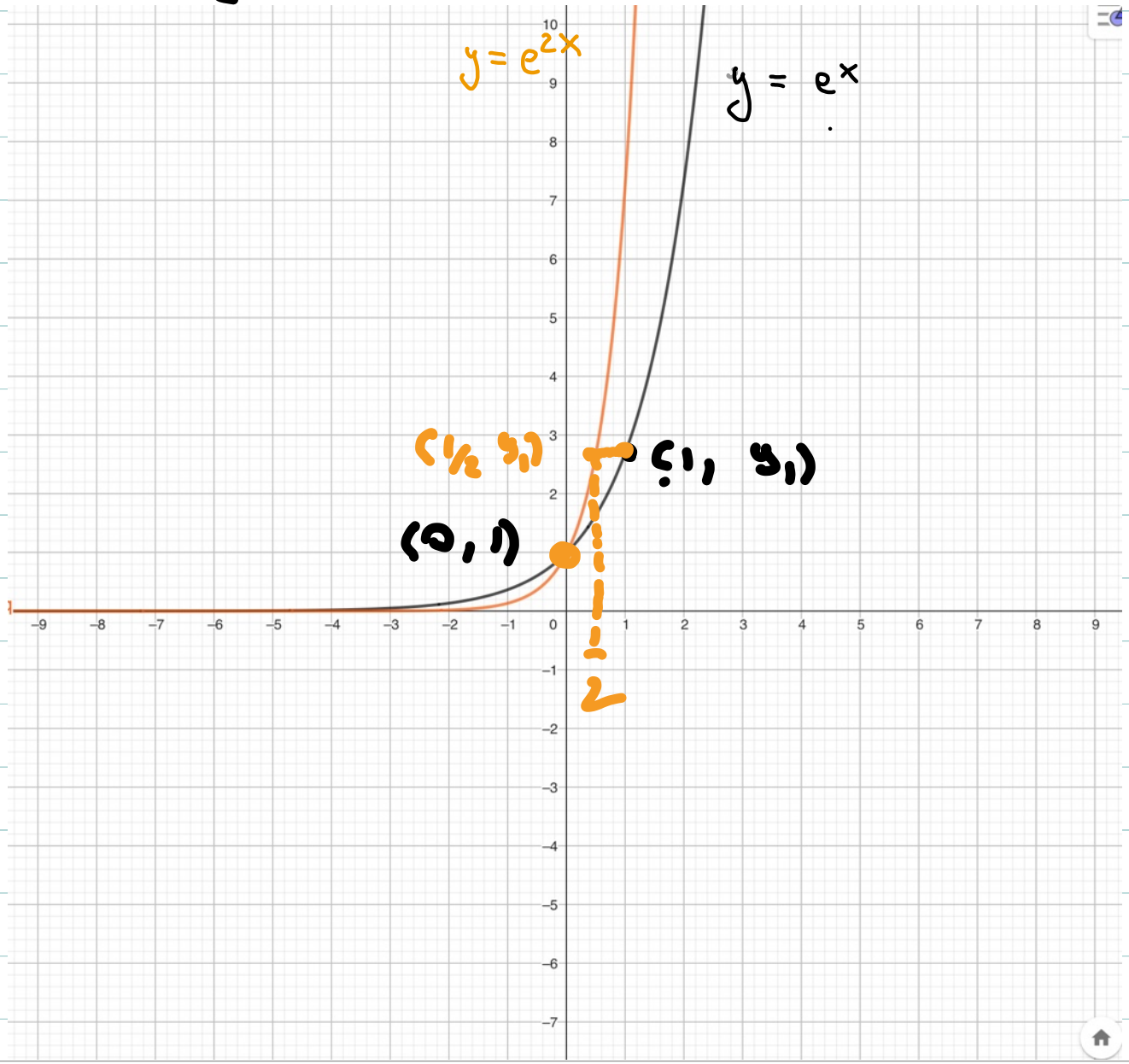
$\frac{2(x-5)}{1} = \frac{x-5}{\frac{1}{2}}$



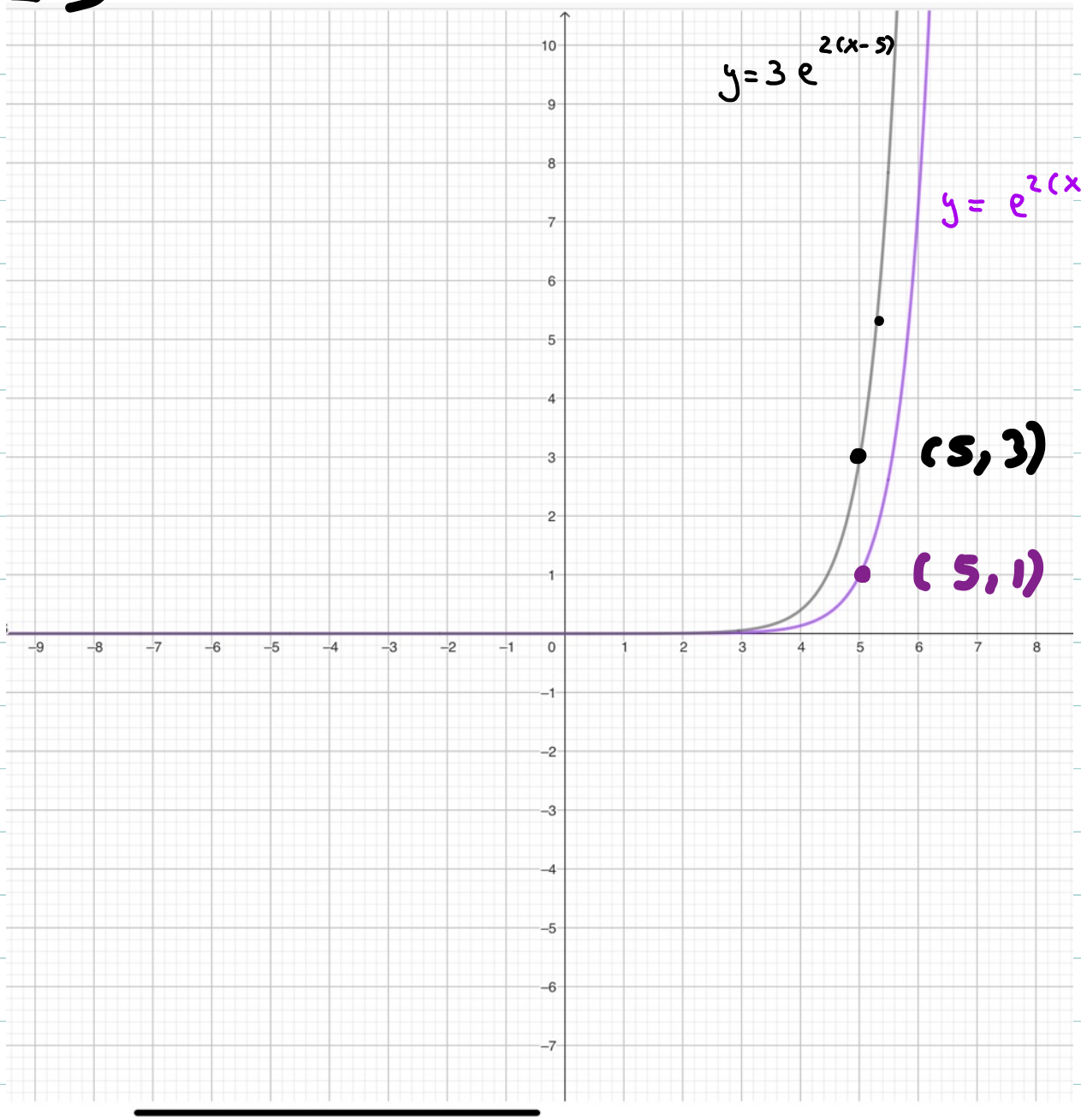
1) scale of $c = \frac{1}{2}$

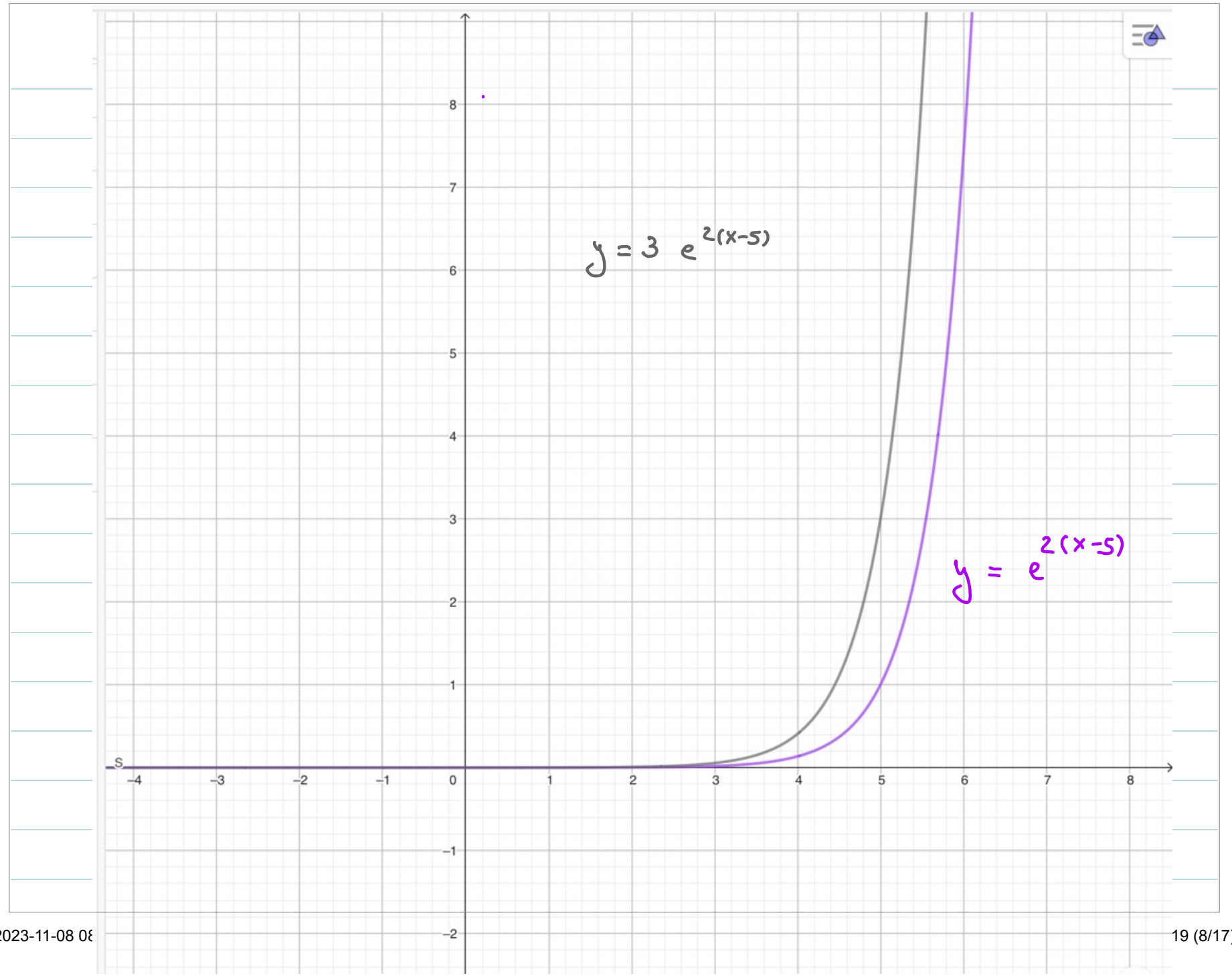
2) shift right 5 units

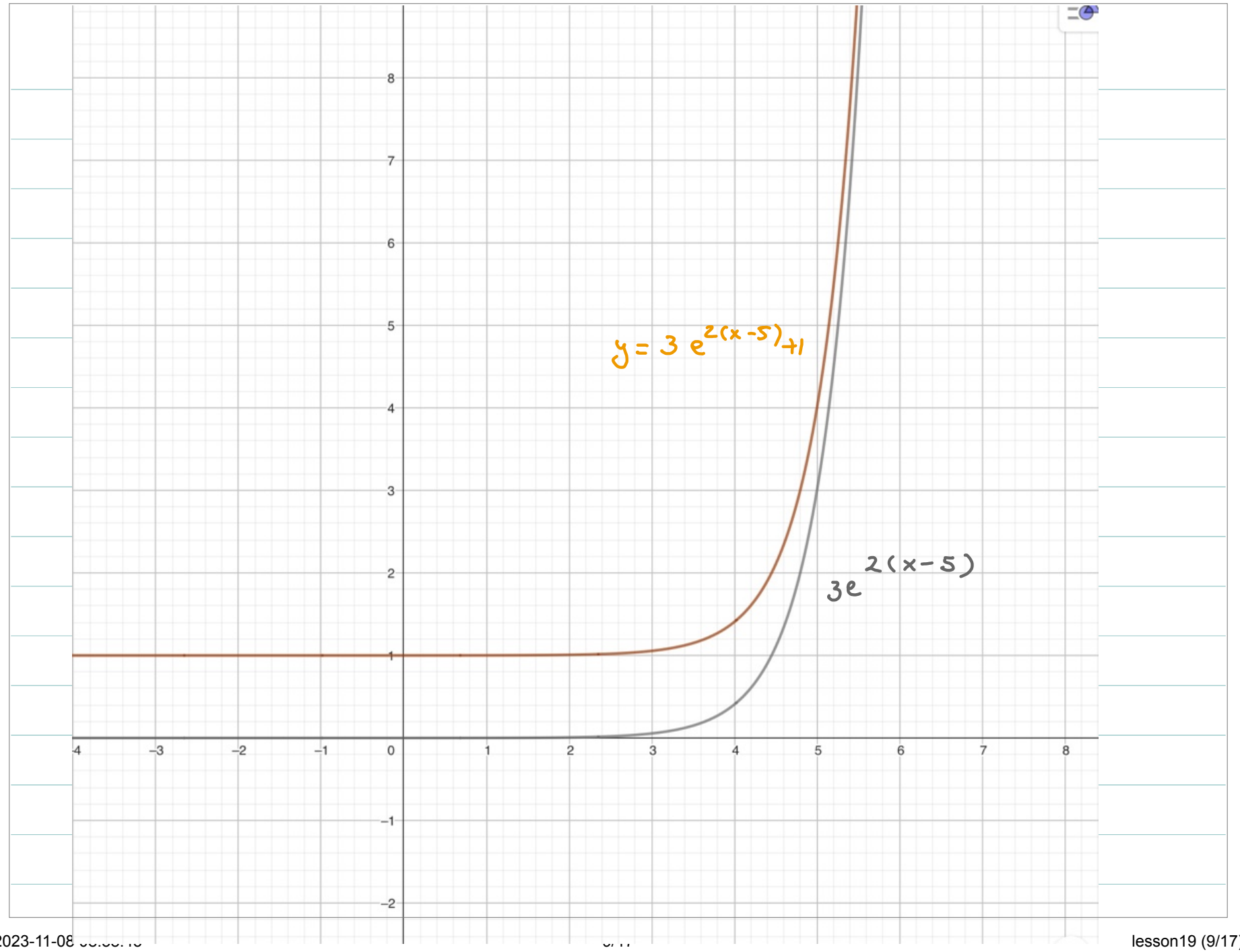
$c = 1/2$



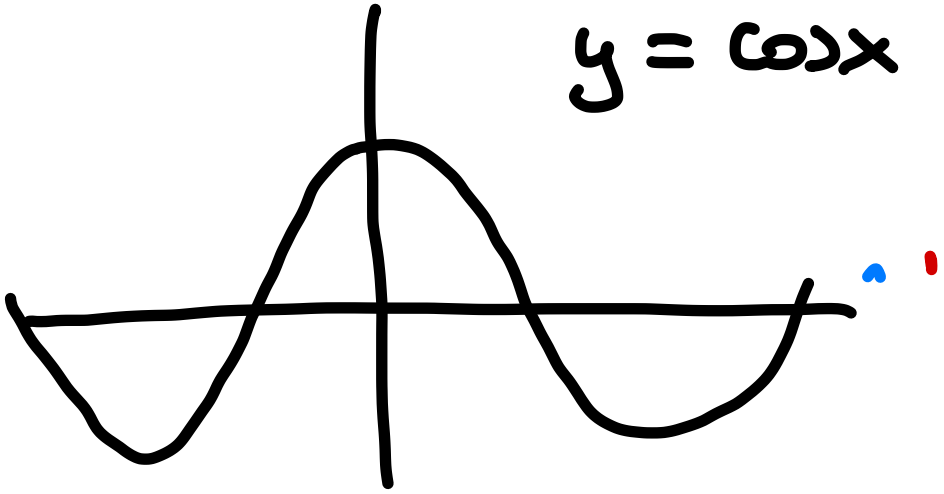
vertical scaling
$c = 3$



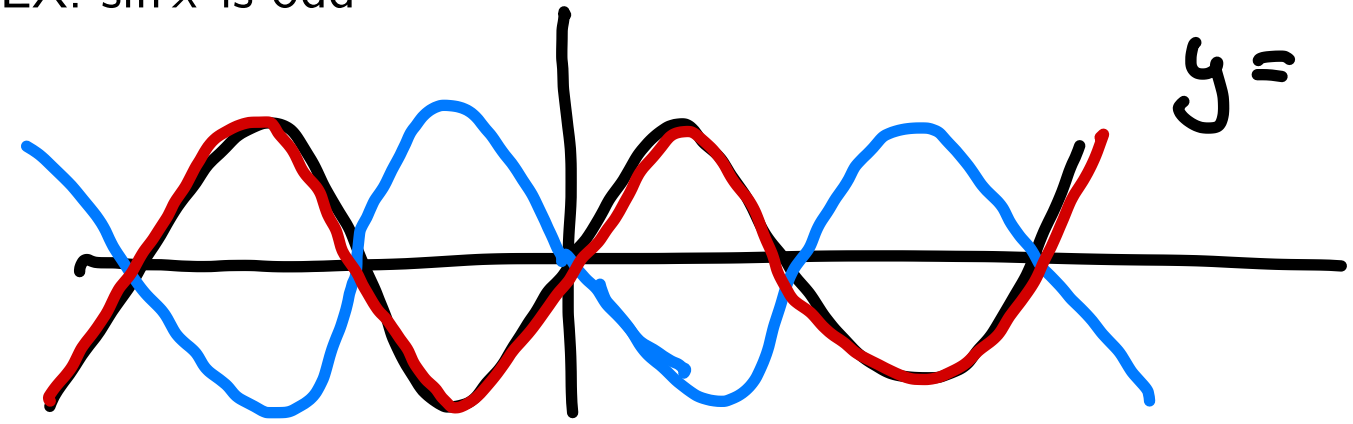

$y = 3\ e^{2(x-5)}$
$y = e^{2(x-5)}$


y = 3 e^{2(x-5)}+1
3e^{2(x-5)}

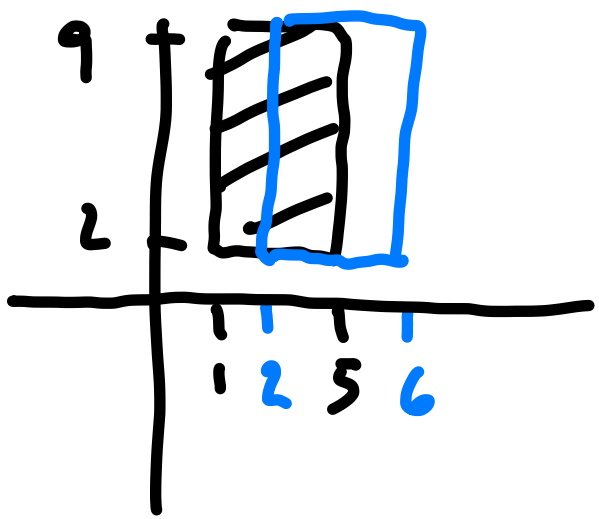
f is even if $f(x) = f(-x)$.
EX: $\cos x$ is even

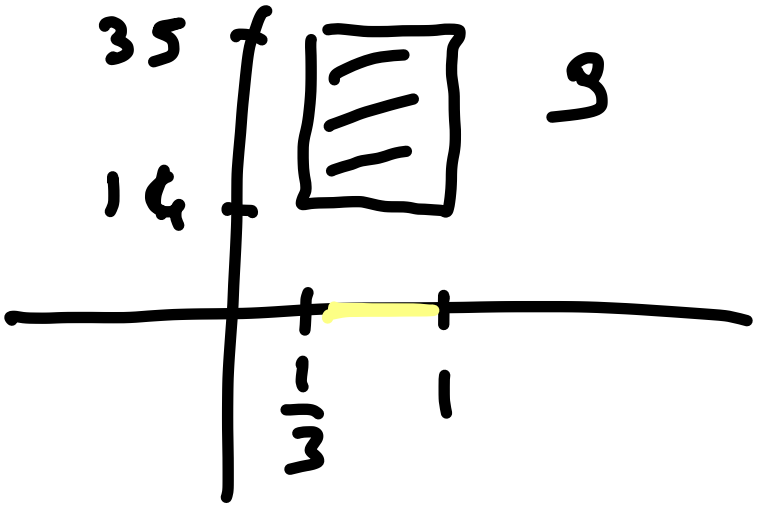


f is odd if $f(x) = -f(-x)$.
EX: $\sin x$ is odd



Suppose $f(x)$ has domain $1 \leq x \leq 5$ and range $2 \leq y \leq 9$ What is the domain and range of $g(x) = 3f(6x - 1) + 8$?





Domain $[1, 5] \to [2, 6] \to [2\cdot\frac{1}{6}\ \ 6\cdot\frac{1}{6}]$

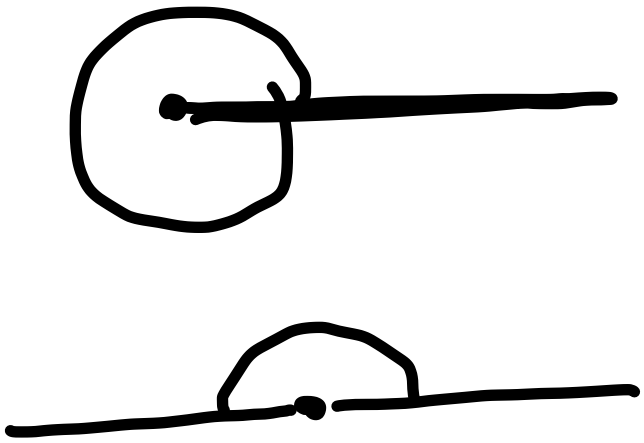
Range $[2, 9] \to [6, 27] \to [14, 35]$

For g Domain $[1/3\ \ 1]$

Range $[14, 35]$

Ch 15

An angle is the part of the plane in between two half lines starting at the same points. Angles are measured in degrees or radians. Certain precalculus/calculus formulas assume angles are measured in radians, so we often use radians as units.



$$360 \text{ deg} = 2\pi \text{ rad}$$

$$180 \text{ deg} = \pi \text{ rad}$$

$$90 \text{ deg} = \frac{\pi}{2} \text{ rad}$$

$$60 \text{ deg} = \frac{\pi}{3} \text{ rad}$$

$$45 \text{ deg} = \frac{\pi}{4} \text{ rad}$$

$$30 \text{ deg} = \frac{\pi}{6} \text{ rad}$$

$$\text{deg} = \frac{360}{2\pi} \text{ rad}$$

$$\text{rad} = \frac{2\pi}{360} \text{ deg}$$

If we measure angles in degrees , then $\frac{1}{60}$ of a degree is a minute and $\frac{1}{60}$ of a minute is a second. Convert 0.3 rad into deg, min, second.

$$0.3 \times \frac{360}{2\pi} = 17.1887 \text{ deg}$$

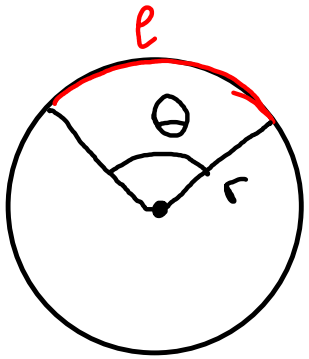
$$17 + \underbrace{0.1887 \times 60}_{11.322} =$$

$$17 + 11 + \underbrace{0.322 \times 60}_{19.32}$$

deg min

$17 + 11 + 19$ sec.

Arclength

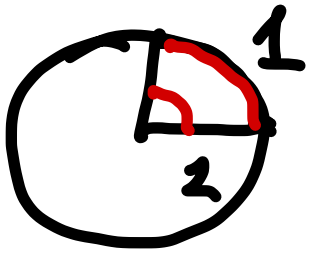


$$\ell = r\theta$$

θ measured in radians

$$\frac{\ell}{2\pi r} = \frac{\theta}{2\pi} \qquad \ell = r\theta$$

1 rad = angle that corresponds to an arc of the unit circle with length 1



$1 = 1 \cdot \theta$ rad

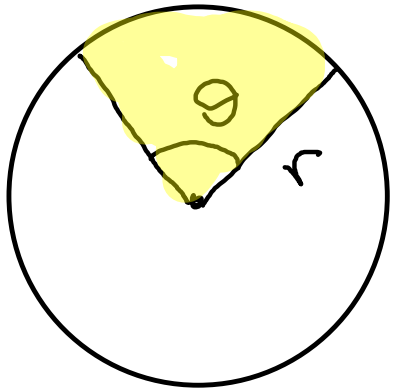
$$\ell = r\,\theta$$

$$\frac{\ell}{r} = \theta$$

$$\frac{\text{feet}}{\text{feet}} = \text{rad}$$

rad is dimentionless unit

Area of wedge



$$A = \frac{1}{2} r^2 \theta$$

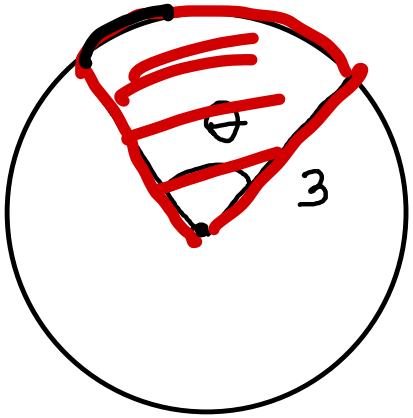
θ measured in radians

$$\frac{A}{\pi r^2} = \frac{\theta}{2\pi}$$

$$A = \frac{1}{2} \theta r^2$$

Given that θ is $\frac{\pi}{6}$ rad and the circle has radius $r = 3$, what is the perimeter of the sector ?

feet



Perimeter :

$$3 + 3 + 3 \cdot \frac{\pi}{6} = 6 + \frac{\pi}{2}$$

$$\text{Area} = \frac{1}{2} \cdot 3^2 \cdot \frac{\pi}{6}$$

A pizza of radius 8 in is divided into 8 equal slices. Tom eats A and Bob eats B. Who eats more ?