

# QUIZ NOTES

## sequences

- arithmetic is when you add or subtract for the rule, this rule is called the common difference

→ recursive formula:  $u_0 = \underline{\quad}$   
 $u_n = u_{n-1} + \underline{\text{rule}}$   
 $n \geq 1$

- geometric is when you multiply ~~but~~ for the rule, this is called the common ratio

→ recursive formula:  $u_0 = \underline{\quad}$   
 $u_n = u_{n-1} \cdot \underline{\text{rule}}$   
 $n \geq 1$

**ex 1** 5, 10, 15, 20...

CD: +5 arithmetic

$u_0 = 5$   
 $u_n = u_{n-1} + 5$   
 $n \geq 1$

**ex 2** 10, 20, 40...

CR:  $\cdot 2$

$u_0 = 10$   
 $u_n = u_{n-1} \cdot 2$  growth.  
 $n \geq 1$

## exponential equations

$y = a(b)^x$  where  $a$  is the starting number  
 where  $b$  is the rule or common ratio.

**ex 3** 4, 2, 1,  $\frac{1}{2}$ ...

CR:  $\cdot \frac{1}{2}$  SN: 4

$y = 4(\frac{1}{2})^x$

## growth/decay

- given growth/decay % need  $b$
- ① put the % into decimal form
- ②  $1 + \text{growth decimal} = b$   
 or  $1 - \text{decay decimal} = b$

IF  $b > 1$  it's growth  
 IF  $0 < b < 1$  it's decay

- given  $b$ , need growth/decay %.

- ①  $b - 1 = \text{growth decimal}$   
 $1 - b = \text{decay decimal}$
- ② multiply by 100 for %.

\* make sure you write growth or decay.

**ex 4**  $y = 10(1.012)^x$

The  $b = 1.012$

$b > 1$  so it's growth

$b - 1 = 1.012 - 1 = 0.012 \cdot 100 = 1.2\%$   
growth

**ex 5**  $y = 5(0.92)^x$

$b = 0.92$

$b$  is a fraction so it's decay.

$1 - 0.92 = 0.08 \cdot 100 = 8\%$   
decay

word problems

**ex 6** You start with \$500 in the bank. You make interest annually at a rate of 5.9%. How much \$ will you have in 5 years?

step 1 write an equation

$b = 1 + 0.059 = 1.059$

$a = 500$

$x = \text{years}$

$y = \$$

$y = 500(1.059)^x$

when  $x = 5$

$y = 500(1.059)^5 = \boxed{\$665.96}$

**ex** You started with ~~10,000~~ a car worth 10,000 £ it loses value each year at a 23% rate. How much will the car be worth in 5 years?

step 1 write an equation

$b = 1 - 0.23 = 0.77$

$a = 10,000$

$x = \text{years}$

$y = \$$

$y = 10,000(0.77)^x$

when  $x = 5$

$y = 10,000(0.77)^5 = \boxed{\$2,706.78}$

graphing exponential equations

$y = a(b)^{\frac{x-h}{c}} + k$

- parent function is  $y = b^x$ . where  $b$  is the base
- always use 3 key points  $x = -1$   
 $x = 0$   
 $x = 1$
- $a$  is the vertical dilation
- $c$  is the horizontal dilation  
\* remember opposite of how written\*
- $h$  is the left/right \* opposite of written\*
- $k$  is up/down
- for VD you multiply y-values
- for HD you multiply x-values
- negatives → if  $a$  is negative flips over X-axis  
if  $c$  is negative flips over Y-axis

**ex**  $y = -2(4)^{\frac{x+1}{3}} + 4$

PF:  $y = 4^x$

flips over x-axis

VD BAFD 2

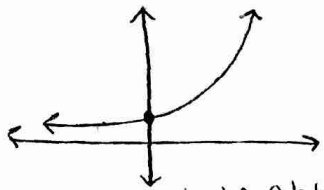
HD BAFD 3

Left 1

up 4.

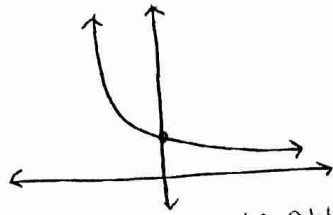
\* when drawing make sure you show the asymptote \*

$$b > 1$$



asymptote at  $y=0$   
middle pt. at  $(0,1)$

$$0 < b < 1$$



asymptote at  $y=0$   
middle pt. at  $(0,1)$

### graph to equation

- 1<sup>st</sup> look at the reflections
  - 2<sup>nd</sup> look at translations
    - up/down look at the asymptote (should be at  $y=0$ , if not theres a transformation)
    - left/right look at the middle point (should be on the  $y$ -axis, if not theres a transformation)
  - 3<sup>rd</sup> look at dilations (careful of units)
    - VD: count distance between middle pt & asymptote
    - HD: count distance between critical points
- \* remember written opposite inequation\*

### properties of exponents

\* for examples see 10/27 notes

$$\textcircled{1} a^m \cdot a^n = a^{m+n}$$

$$\textcircled{2} \frac{a^m}{a^n} = a^{m-n}$$

$$\textcircled{3} (a^m)^n = a^{m \cdot n}$$

$$\textcircled{4} a^{-m} = \frac{1}{a^m} \quad \& \quad \frac{1}{a^{-n}} = a^n$$

$$\textcircled{5} \left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$$

$$\textcircled{7} -2^4 = -16 \quad * \text{careful with negatives}$$

$$(-2)^4 = 16$$

$$\textcircled{8} a^0 = 1$$

$\textcircled{6}$  dont forget to distribute to everything

$$(x^m y^n)^b = x^{m \cdot b} y^{n \cdot b}$$