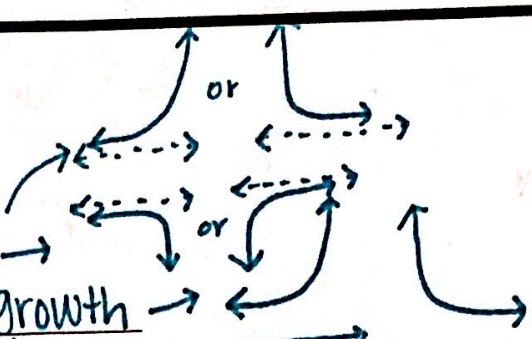
Unit 4 EOC Review Notes

I. Exponentials

- Always raised to the X power
- Shape = curve
- Direction
  - If a is Positive, it faces up
  - If a is negative, it faces down



- Growth vs. Decay
  - If b is greater than 1, it's a growth
  - If b is less than 1, it's a decay
- Standard form : $y = ab^x$ a = Start value b = Ratio/Rate (b>0)
- Transformations: tells where the graph was moved in relation to the origin
  - $f(x) = -a(b)^{x-h} \boxed{+k}$ → Asymptote

Reflected

Stretch (a>1) left (+) up (+)

Shrink (0<a<1) Right (-) down (-)

II. Exponent Rules

- Multiplying: Add the exponents
- Dividing: Subtract the exponents
- Power to a power: Multiply the exponents
- Power of a Product or Quotient: "Distribute" the exponents
- Power of Zero: Anything raised to the 0 power is 1 $(x^0 = 1)$
- Negative Exponents:
  - Can't have negative exponents
  - Move to the opposite side of the fraction to make positive

Ex: $(e^2f^4)(ef)^2$

$(e^2f^4)(e^2f^2)$

$\boxed{e^4f^6}$

$\frac{10x^4y^8}{22x^2y}$

$\boxed{\frac{5x^2y^7}{11}}$

$\frac{6^{-2}x^4}{2^{-3}x^{-3}}$

$\frac{2^3x^4x^3}{6^2} = \frac{8x^7}{36} = \boxed{\frac{2x^7}{9}}$

III. Solving Exponentials

- Isolate the Base
- Write both sides of the equation as an exponential expression with like bases
- Set the exponents equal to each other
- Solve

$4^{-2x} \cdot 4^x = 64$

$4^{-x} = 64$

Plug in Answer choices

EX: $3^{2x-5} = 3^{x+3}$

$2x - 5 = x + 3$

$-x \quad -x$

$x - 5 = 3$

$\boxed{x = 8}$

$3^{2x+3} = 27^{x+1}$

$3^{2x+3} = (3^3)^{x+1}$

$2x + 3 = 3x + 3$

$-2x \quad -2x$

$3 = x + 3$

$-3 \quad -3$

$\boxed{x = 0}$

$2^x = \left(\frac{1}{2}\right)^{x-3}$

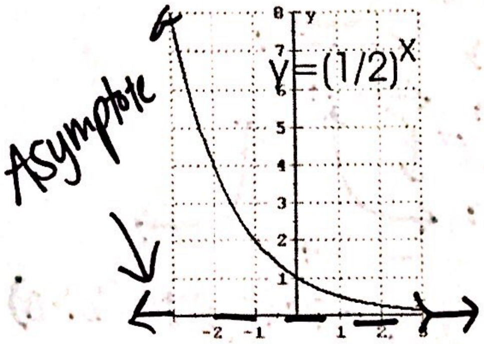
$2^x = (2^{-1})^{x-3}$

$x = -x + 3$

$\frac{2x}{2} = \frac{3}{2}$

$\boxed{x = \frac{3}{2}}$

IV. Characteristics of Exponentials



(x) Domain: $(-\infty, \infty)$
(y) Range: $(0, \infty)$
Asymptote: $y=0$
x-intercept: none
y- intercept: $(0,1)$
Increasing or Decreasing
End Behavior: $x \to \infty$, $f(x) \to$ 0
$x \to -\infty$, $f(x) \to$ ∞

V. Geometric Sequences

- ~~Arithmetic~~ Geometric sequences: Common Ratio ($\cdot$ or $\div$)
  - Explicit formula: $a_n = a_1(r)^{n-1}$
  - Recursive formula: $a_1 = \#$
    $a_n = R(a_{n-1})$

Ex: Given the sequence 40, 20, 10, 5,… What is the common ratio? What is the explicit formula?

R : $\frac{20}{40} = \boxed{\frac{1}{2}}$

EF : $a_n = 40(1/2)^{n-1}$

VI. Growth and Decay

- Growth Formula: $y = P(1+r)^t$ (use for appreciating or increasing values)
  $(1 + r)$ is the growth factor and r is the growth Rate (decimal)
- Decay Formula: $y = P(1-r)^t$ (use for depreciating or decreasing values)
  $(1 - r)$ is the decay factor and r is the decay Rate (decimal)

Compound Interest

- $A = P\left(1+\frac{r}{n}\right)^{nt}$

P = principal amount (Starting amount)
r = interest rate in decimal form
n = # of times the money is compounded in one year
t = time in years

monthly (n = 12)
daily (n = 365)
quarterly (n = 4)
semiannually (n=2)
annually (n=1)