

## SECTION 3.3 - EXPONENTIAL FUNCTIONS

### REVIEW

① SIMPLIFY:

(A)  $\frac{34x^2y^{-2}z^2}{17x^{-5}yz}$

(B)  $(2x^4y^{-3})^{-2}$

(C)  $\frac{3x^3y^{-1}z^{-1}}{x^{-4}y^0z^0}$

② SIMPLIFY:

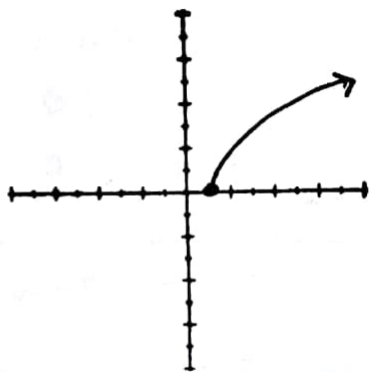
(A)  $\sqrt{147m^3n^4}$

(B)  $-\sqrt{12} + 7\sqrt{3} + \sqrt{75}$

(C)  $\sqrt{10x^2} \sqrt{5x^3}$

(D)  $-3\sqrt{3}(2 + \sqrt{6})$

③ GIVE DOMAIN + RANGE FOR  $f(x)$  GRAPHS BELOW:



D:

R:

CONTINUED →

④ FIND THE AVERAGE RATE OF CHANGE OF  $f(x) = 3x^2 + 1$  ON THE INTERVAL FROM  $x=1$  TO  $x=3$ .

\* EXPONENTIAL FUNCTIONS \*

AN EXPONENTIAL FUNCTION HAS A VARIABLE AS ITS EXPONENT.  
THE GENERAL FORM OF AN EXPONENTIAL FUNCTION IS:

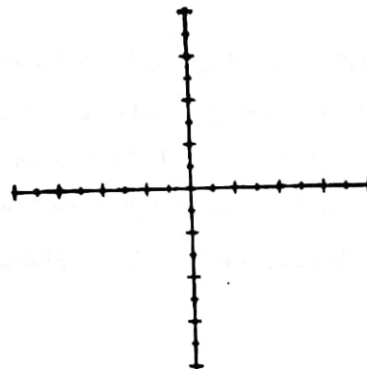
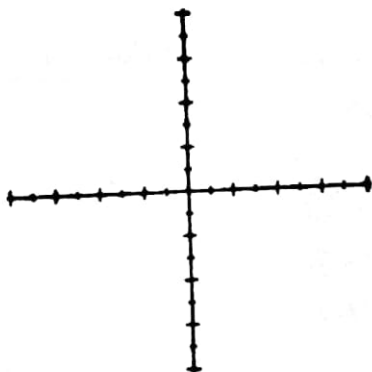
$$y =$$

WHERE  $b > 0$  AND  $b \neq 1$ .

WHERE  $a$  IS THE  
AND  $b$  IS THE

ex)  $y = 3 \cdot 2^x$

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



Y-INT:

D:

R:

Y-INT:

D:

R:

\* WHEN  $b > 1$ ,

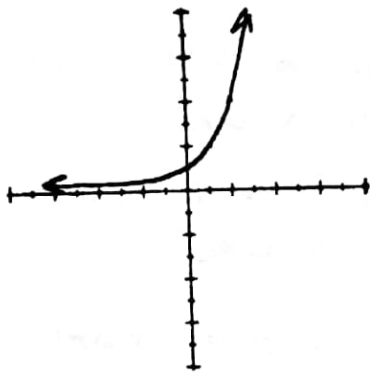
⑩ \* WHEN  $0 < b < 1$ ,

## \* KEY FEATURES OF THE GRAPHS OF EXPONENTIAL FUNCTIONS \*

X-INTERCEPT: THE POINT  $(a, 0)$  WHERE THE GRAPH CROSSES THE X-AXIS. (NOTE: THERE MAY NOT BE ONE.)

Y-INTERCEPT: THE POINT  $(0, b)$  WHERE THE GRAPH CROSSES THE Y-AXIS. ALSO THE INITIAL VALUE.

(ex) THE GRAPH AND TABLE FOR  $f(x) = 2^x$  ARE SHOWN BELOW:



x	f(x)
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
2	4
1	2

WHAT IS THE X-INTERCEPT?

WHAT IS THE Y-INTERCEPT?

END BEHAVIOR - FUNCTIONS CAN ALSO BE DESCRIBED IN TERMS OF THEIR END BEHAVIOR. IN OTHER WORDS, WHAT HAPPENS WHEN: (A) WE LOOK AT LARGER + LARGER VALUES OF X, AND (B) WE LOOK AT SMALLER + SMALLER VALUES OF X.

(ex) DESCRIBE THE END BEHAVIOR OF  $f(x) = 2^x$ .

ASYMPTOTES - THE LINE THAT THE FUNCTION APPROACHES BUT NEVER TOUCHES IS CALLED A HORIZONTAL ASYMPTOTE.

(ex) WHAT IS THE HORIZONTAL ASYMPTOTE FOR  $f(x) = 2^x$ ?

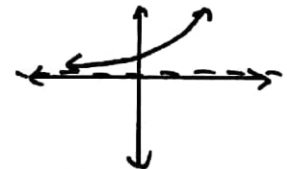
DOMAIN: THE SET OF ALL X-VALUES THAT "MAKE SENSE" FOR THE FUNCTION.

RANGE: THE SET OF ALL Y-VALUES THAT ARE "OUTPUTS" FOR THE FUNCTION.

24) WHAT ARE THE DOMAIN + RANGE FOR  $f(x) = 2^x$ ?

D:

R:



MAXIMUM: THE LARGEST Y-VALUE THAT A FUNCTION CAN ATTAIN.

MINIMUM: SMALLEST Y-VALUE THAT A FUNCTION CAN ATTAIN.

25) WHAT IS THE MAXIMUM OF  $f(x) = 2^x$ ?

WHAT IS THE MINIMUM OF  $f(x) = 2^x$ ?

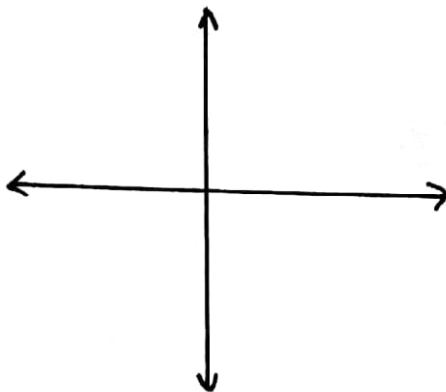
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APPLICATION GIVEN THE FUNCTION  $g(x) = 3^x$ .

(A) COMPLETE THE TABLE. DO NOT USE DECIMALS.

x	-3	-2	-1	0	1	2
g(x)						

(B) SKETCH THE GRAPH. LABEL APPROPRIATE POINTS.



(C) DESCRIBE END BEHAVIOR.

(D) GIVE Y-INTERCEPT.

(E) GIVE EQUATION OF HORIZONTAL ASYMPTOTE.

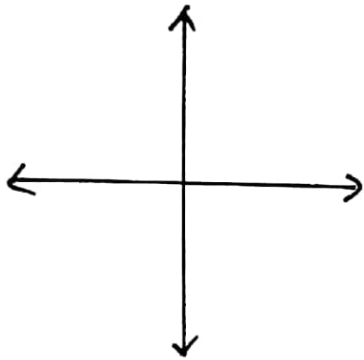
(F) DOMAIN:  
RANGE:

20

PRACTICE.

① GIVEN  $g(x) = \left(\frac{1}{2}\right)^x$ ,

Ⓐ SKETCH THE GRAPH OF  $g(x)$ . LABEL SIGNIFICANT POINTS.



Ⓑ DESCRIBE END BEHAVIOR.

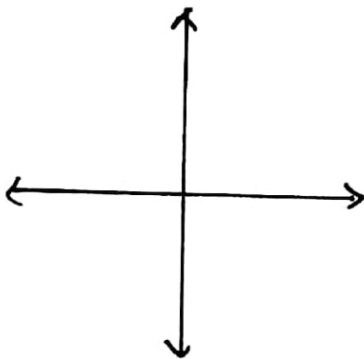
Ⓒ GIVE Y-INTERCEPT.

Ⓓ GIVE EQUATION OF HORIZONTAL ASYMPTOTE.

Ⓔ DOMAIN:  
RANGE:

② GIVEN  $h(x) = (2.15)^x$ ,

Ⓐ SKETCH THE GRAPH OF  $h(x)$ . LABEL SIGNIFICANT POINTS.



Ⓑ DESCRIBE END BEHAVIOR.

Ⓒ GIVE Y-INTERCEPT.

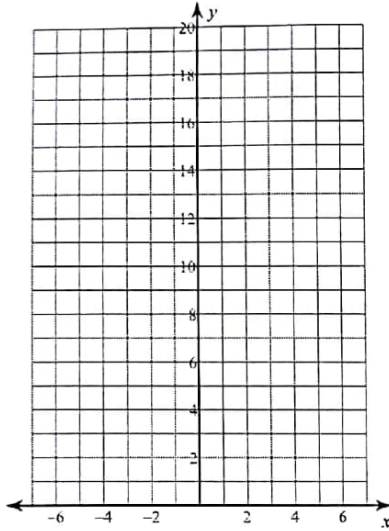
Ⓓ GIVE EQUATION OF HORIZONTAL ASYMPTOTE.

Ⓔ DOMAIN:  
RANGE:

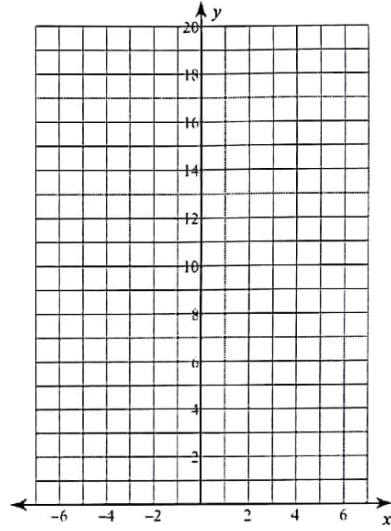
### Graphing Exponential Functions

Sketch the graph of each function.

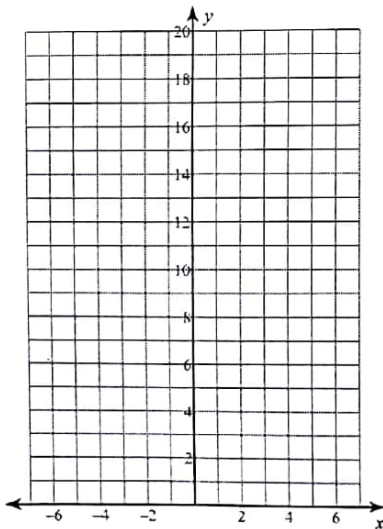
1)  $y = 4 \cdot 2^x$



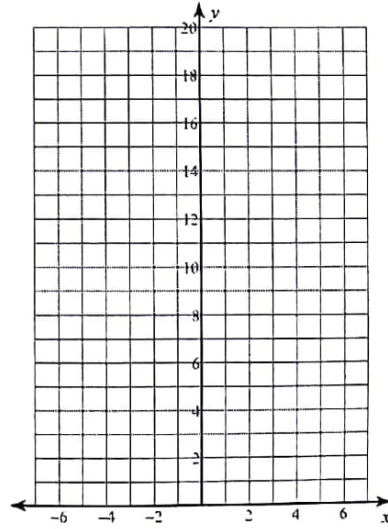
2)  $y = 5 \cdot 2^x$



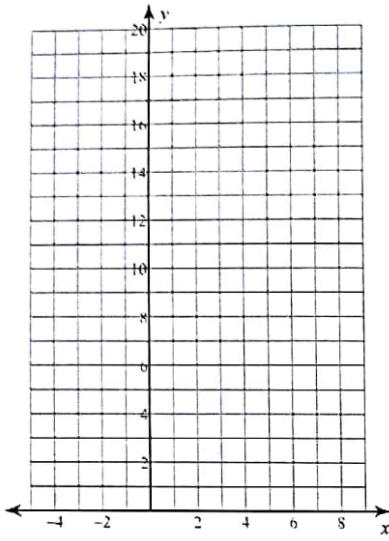
3)  $y = 4 \cdot \left(\frac{1}{2}\right)^x$



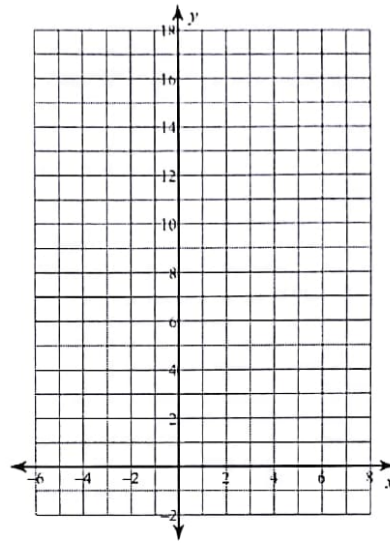
4)  $y = 2 \cdot \left(\frac{1}{2}\right)^x$



5)  $y = 3 \cdot 2^{x-2} + 2$

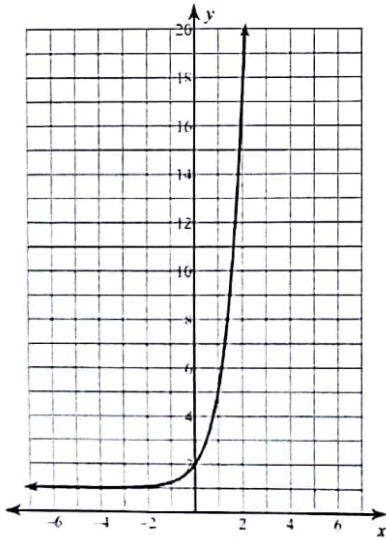


6)  $y = 4 \cdot \left(\frac{1}{2}\right)^{x-1} - 2$



Write an equation for each graph.

7)



8)

