شكراً لتحميلك هذا الملف من موقع المناهج الإماراتية

شرح الدرس الأول functions exponential Graphing من الوحدة الخامسة

تاريخ نشر الملف على موقع المناهج: 2023-10-04 04:43:27 | اسم المدرس: محمد زياد

التواصل الاجتماعي بحسب الصف الحادي عشر المتقدم

روابط مواد الصف الحادي عشر المتقدم على تلغرام

التربية الاسلامية	اللغة العربية	اللغة الانجليزية	الرياضيات

المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة رياضيات في الفصل الأول

1	أوراق عمل الدرس الأول من الوحدة الخامسة Graphing Exponential Functions
2	حل أسئلة الامتحان النهائي ريفيل
3	حل أسئلة الامتحان النهائي بريدج
4	حل أسئلة امتحان وفق الهيكل الوزاري نخبة
5	مراجعة نهائية وفق الهيكل الوزاري

المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة رياضيات في الفصل الأول

Mr. Mohammed Ziad
0507214939

Lesson 5-1

Graphing Exponential Functions

SCAN ME

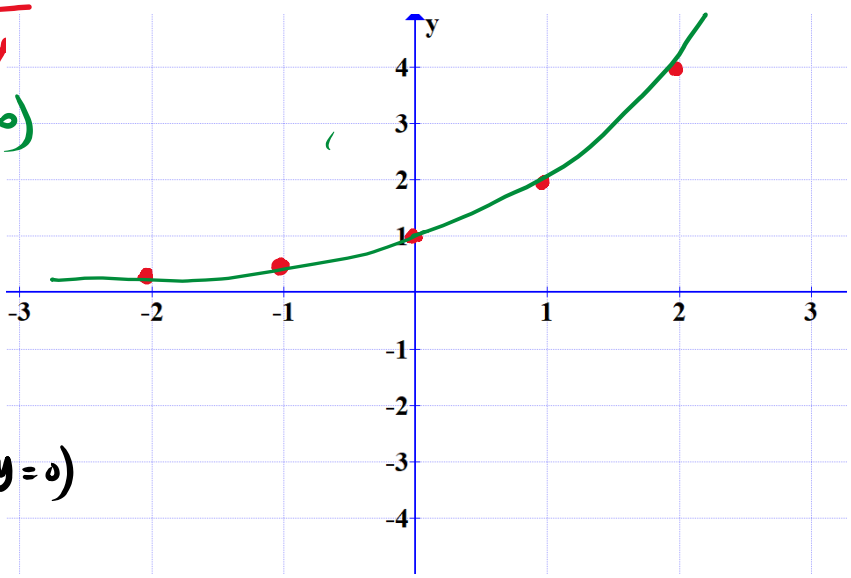
Math Island
Telegram page

Example 1 Graph Exponential Growth Functions

Graph $f(x) = 2^x$. Find the domain, range, y-intercept, asymptote, and end behavior.

base $2 > 1$
$\Rightarrow$ exponential growth

x	-2	-1	0	1	2
y	0.25	0.5	1	2	4



Domain: $\mathbb{R}$ or $(-\infty, \infty)$

Range: $(0, \infty)$

y-int = 1

Asymptote: x-axis or $(y = 0)$

End behaviour:

$x \to -\infty$ $\quad f(x) \to 0$

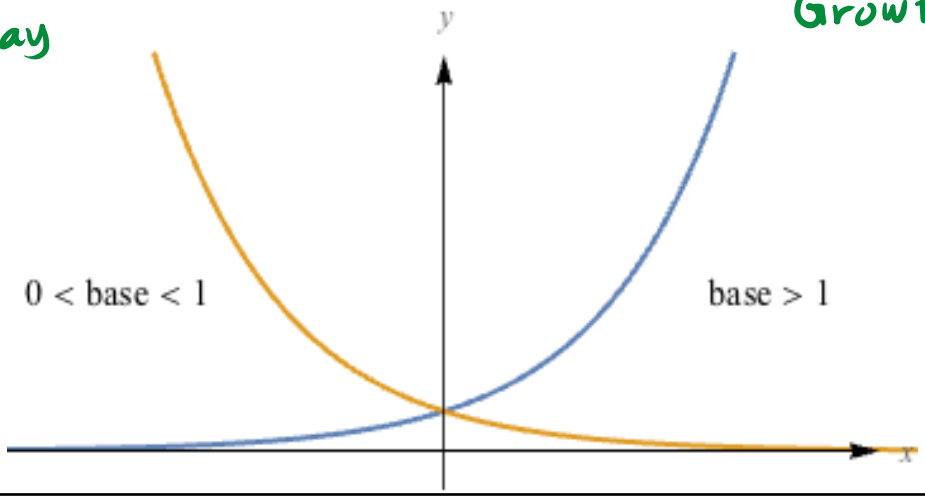
$x \to \infty$ $\quad f(x) \to \infty$

Generally:

For any exponential function $f(x) = a^x$

$0 < a < 1$ decay

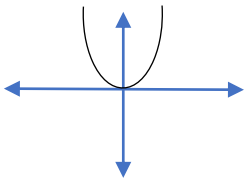
$a > 1$ Growth



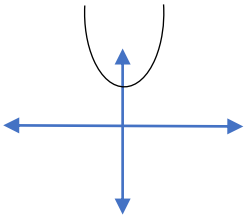
Functions transformations:

Transformation Rules for Functions		
Function Notation	Type of Transformation	Change to Coordinate Point
f(x) + d	Vertical translation up d units	(x, y) → (x, y + d)
f(x) – d	Vertical translation down d units	(x, y) → (x, y – d)
f(x + c)	Horizontal translation left c units	(x, y) → (x – c, y)
f(x – c)	Horizontal translation right c units	(x, y) → (x + c, y)
–f(x)	Reflection over x-axis	(x, y) → (x, –y)
f(–x)	Reflection over y-axis	(x, y) → (–x, y)
af(x)	Vertical stretch for |a| > 1	(x, y) → (x, ay)
	Vertical compression for 0 < |a| < 1	
f(bx)	Horizontal compression for |b| > 1	$(x, y) \rightarrow \left(\frac{x}{b}, y\right)$
	Horizontal stretch for 0 < |b| < 1	

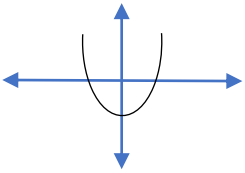
For the parent function $f(x)=x^2$ which has the graph ====>



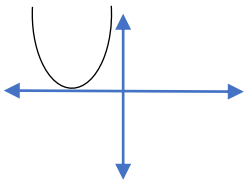
1) $g(x)=x^2+2$ translation 2 units up



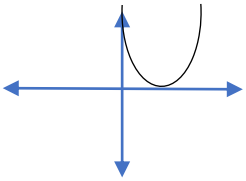
2) $g(x)=x^2-2$ translation 2 units down



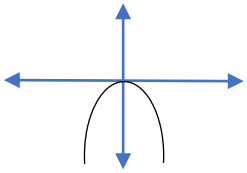
3) $g(x)=(x+2)^2$ translation 2 units to the left



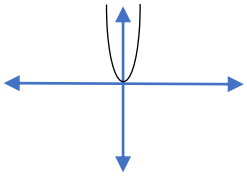
4) $g(x)=(x-2)^2$ translation 2 units to the right



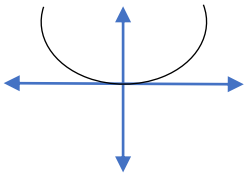
5) $g(x)= -x^2$ reflection in the x-axis (Up-Down)



6) $g(x)=3x^2$ stretch vertically



7) $g(x)=0.5x^2$ compress vertically



Example 2 Graph Transformations of Exponential Growth Functions

Graph $g(x) = -\frac{1}{2} \cdot 3^{x+4} + 1$.

parent function $f(x) = 3^x$

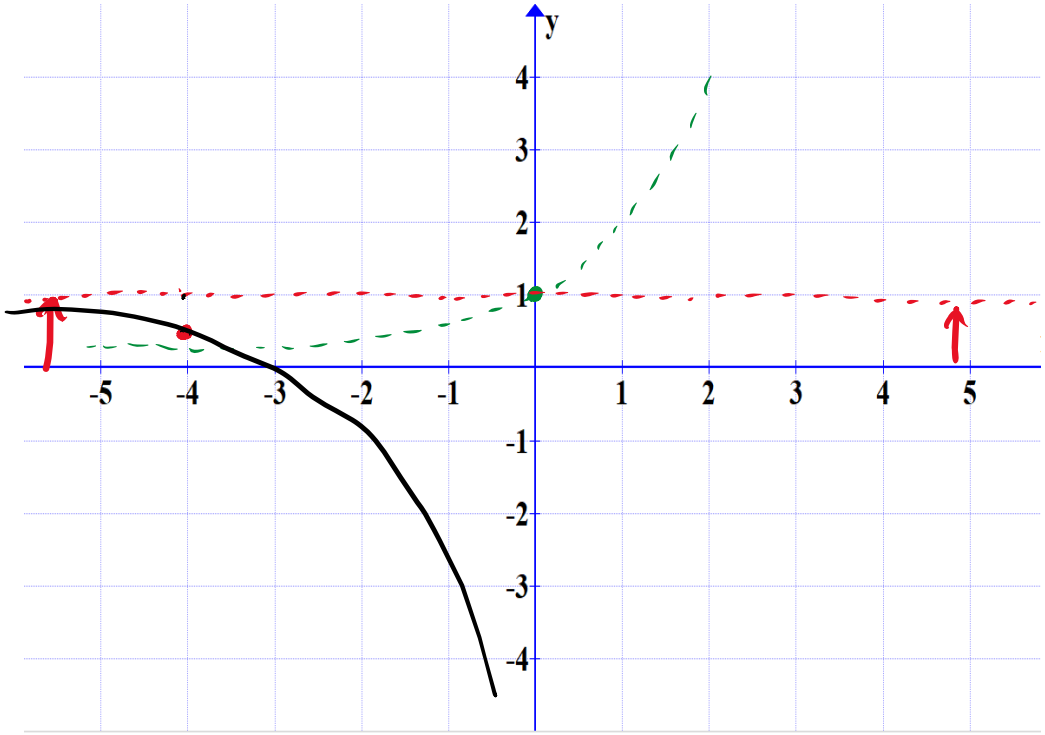
① Translation 4 units left

② Vertical compression by factor $\frac{1}{2}$

③ Reflection over the x-axis

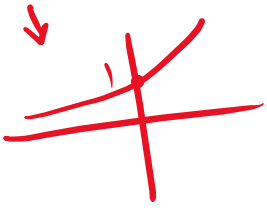
④ Translation 1 unit up

$(0, 1)$
$\downarrow$ $\times -\frac{1}{2}$
-4 $+1$
$(-4, \frac{1}{2})$

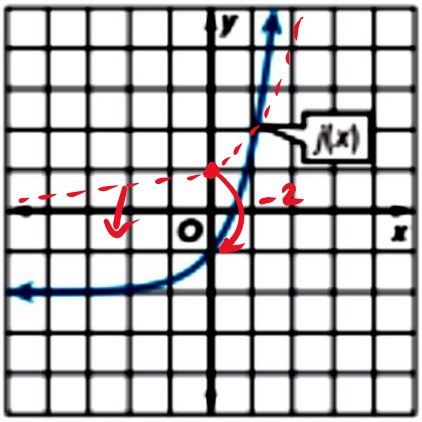


Example 3 Analyze Graphs of Exponential Functions

Identify the value of k and write a function for the graph of $j(x) = f(x) + k$ as it relates to $f(x) = 3.5^x$.

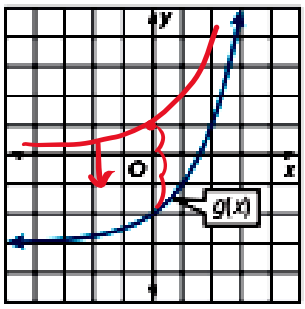


$k = -2$



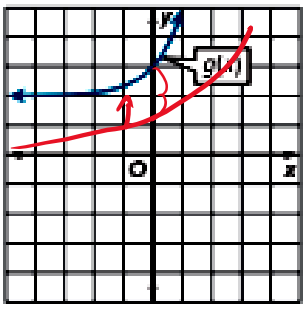
Identify the value of k and write a function $g(x)$ for each graph as it relates to $f(x)$.

11. $f(x) = 2^x$; $g(x) = f(x) + k$



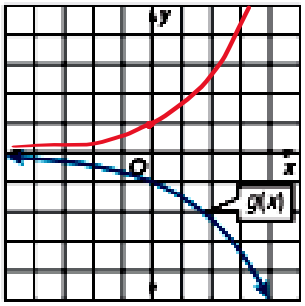
$k = -3$

12. $f(x) = 3^x$; $g(x) = f(x) + k$



$k = 2$

13. $f(x) = \left(\frac{3}{2}\right)^x$; $g(x) = k \cdot f(x)$



Reflec

$k = -1$

Applications:

Exponential growth can be modeled by $A(t) = a(1 + r)^t$, where $A(t)$ represents the amount after t time periods, a is the initial amount, and r is the percent of increase per time period. The **growth factor** is $1 + r$.

Exponential decay occurs when an initial amount decreases by the same percent over a given period of time. So, for an exponential function of the form $f(x) = b^x$, exponential decay occurs when b is between 0 and 1.

Like exponential growth, exponential decay can be modeled by $A(t) = a(1 - r)^t$, where r is the percent of decrease per time period. The **decay factor** is $1 - r$.

Example 4 Use Exponential Growth Functions

LOTTERY **Mr. Lopez recently won the lottery. Suppose he takes the lump-sum payment, and he invests $50 million into an account that yields 5% interest annually. Graph a function that models the amount in his account. Then estimate the amount in the account after 20 years.**

$a = 50$ million , $r = 5\%$

$A(t) = 50(1 + 0.05)^t = 50(1.05)^t$

after 20 years $\Rightarrow t = 20$

$A(20) = 50(1.05)^{20} = 132.7$ million

Example 5 Interpret Exponential Functions

Determine whether each function represents *exponential growth* or *exponential decay*.

a. $f(x) = 5^x$ $5 > 1 \Rightarrow$ growth

b. $g(x) = \left(\frac{2}{7}\right)^x$ $\frac{2}{7} < 1 \Rightarrow$ decay

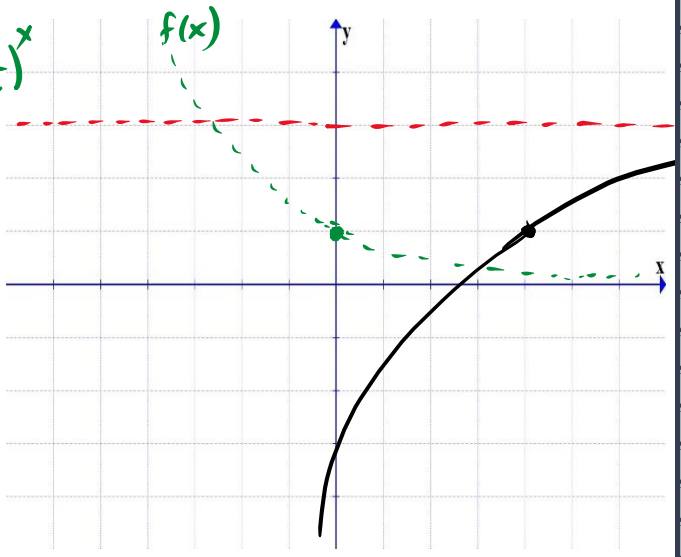
c. $h(x) = \left(\frac{4}{3}\right)^x$ growth

d. $j(x) = 1.05^x$ growth

e. $k(x) = 0.85^x$ decay

Example 7 Graph Transformations of Exponential Decay Functions

Graph $g(x) = -2\left(\frac{1}{4}\right)^{x-4} + 3$. parent $f(x) = \left(\frac{1}{4}\right)^x$



① translation 4 right

② V. strech by factor 2

③ Reflection across x-axis

④ translation 3 units up

$(0, 1)$
$\downarrow +4$ $x-2+3$
$(4, 1)$

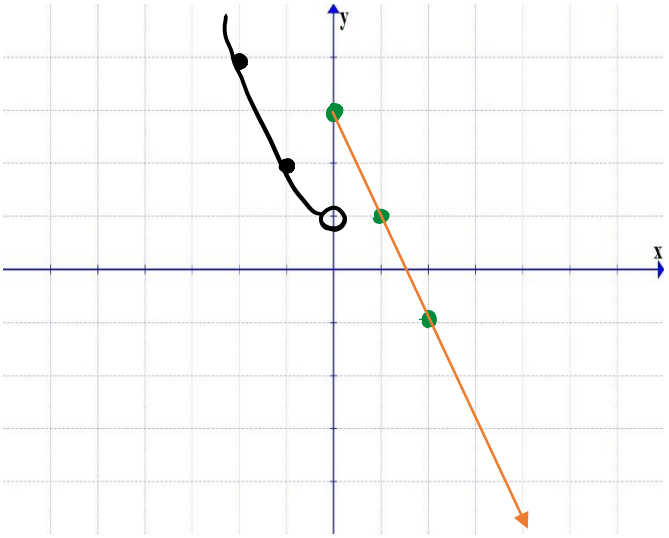
Ex: Sketch the graph of the function $f(x) = \begin{cases} \left(\frac{1}{2}\right)^x, & x < 0 \\ -2x + 3, & x \geq 0 \end{cases}$

① $f(x) = \left(\frac{1}{2}\right)^x$, $x < 0$

x	0	-1	-2
y	1	2	4

② $f(x) = -2x + 3$, $x \geq 0$

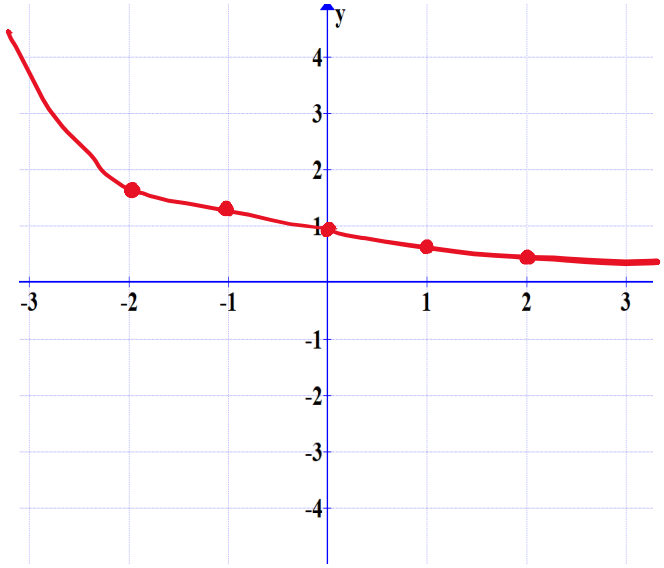
x	0	1	2
y	3	1	-1



YOUR TURN

Q1) Graph the function $f(x) = (\frac{3}{4})^x$ then find its domain, range , y-intercept and End behavior

x	-2	-1	0	1	2
y	1.77	1.3	1	0.75	0.56



Domain : $(-\infty, \infty)$

Range : $(0, \infty)$

y-int = 1

End behavior:

$x \to -\infty$ $\quad f(x) \to \infty$

$x \to \infty$ $\quad f(x) \to 0$

Q2) **INVESTMENTS** At age 28, Catalina makes a single $22,000 investment that earns 5% interest each year.

a. If Catalina leaves the investment untouched until she turns 65, how much will the investment be worth at that time?

b. Catalina's twin brother, Rodrigo, waits 2 years and then makes the same investment as Catalina. If the function that describes Catalina's investment is $C(t)$, what function describes Rodrigo's investment? What will his investment be worth when he turns 65?

a) $P = 22000$, $r = 0.05$, $t = 65 - 28 = 37$

$C(t) = 22000(1+0.05)^t = 22000(1.05)^t$

$C(37) = 22000(1.05)^{37} = 133790.9$

b) $P = 22000$ $\quad r = 0.05$ $\quad t = 35$

$R(t) = 22000(1.05)^t$

$R(35) = 22000(1.05)^{35} = 121352.3$