Warm Up

1. Express as a single power of 2: $\dfrac{8^{3n+2} \bullet 4^{n-1}}{16^{-2}} = \ ?$

[A] 2^{11n-4} [B] 2^{11n+12} [C] 2^{11n-7} [D] 2^{11n+9}

2. Evaluate the following: $-3^2 + 2^0 - \left(\frac{1}{3}\right)^{-1}$

[A] -12 [B] -11 [C] 7 [D] -5

$-9+1-3$

3. Solve:

$b) \left(\frac{1}{9}\right)^{x-2} = \left(\frac{1}{27}\right)^{x+2}$

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

$\left(\frac{1}{3}\right)^{2x-4} = \left(\frac{1}{3}\right)^{3x+6}$

$2x-4=3x+6$

$-10=x$

1. Express as a single power of 2: $\dfrac{8^{3n+2} \bullet 4^{n-1}}{16^{-2}} = \ ?$

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$$\frac{(2^3)^{3n+2} \cdot (2^2)^{n-1}}{(2^4)^{-2}}$$

$$\frac{2^{9n+6} \quad 2^{2n-2}}{2^{-8}}$$

$$2^{9n+6} \cdot 2^{2n-2} \cdot 2^{8}$$

$$2^{11n+12}$$

Substitution Method

Solve the following...

$2^x = 6$

$-32 \times -1 = 32$
$-32 + -1 = -33$

$2^{2(x)} - 33(2^x) + 32 = 0$

$b^2 - 33(b) + 32 = 0$

$b^2 - 32b - 1b + 32 = 0$

$b(b-32) - 1(b-32)$

$(b-32)(b-1)$

$b = 32$

$b = 1$

$2^x = 32$ and $2^x = 1$

$2^x = 2^5$ $\quad 2^x = 1$

$x = 5$ $\quad x = 0$

Substitution Method

Solve the following...

$125(5^{2x}) - 30(5^x) + 1 = 0$

let $y = 5^x$

$a = 125$

$b = -30$

$c = 1$

$125(5^x)^2 - 30(5^x) + 1 = 0$

$125y^2 - 30y + 1 = 0$ $\quad -25 \times -5 = 125$, $-25 + -5 = -30$

$125y^2 - 25y - 5y + 1 = 0$

$25y(5y - 1) - 1(5y - 1)$

$25y - 1 = 0$

$5y - 1 = 0$

$y = \frac{1}{25}$ and $\frac{1}{5}$

$5^x = \frac{1}{25}$ | $5^x = \frac{1}{5}$

$5^x = \frac{1}{5^2}$ $\quad 5^x = 5^{-1}$

$5^x = 5^{-2}$ $\quad x = -1$

$x = -2$

Notes:

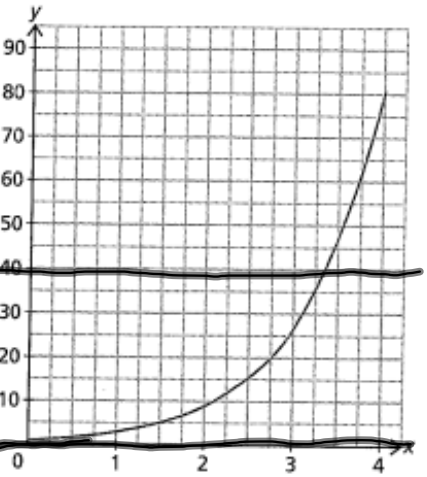
$$y = b^x$$ ← Base (common ratio)

- Exponential Functions are either growth or decay curves

Step A

$y = 3^x$

x	0	1	2	3	4
y	1	3	9	27	81

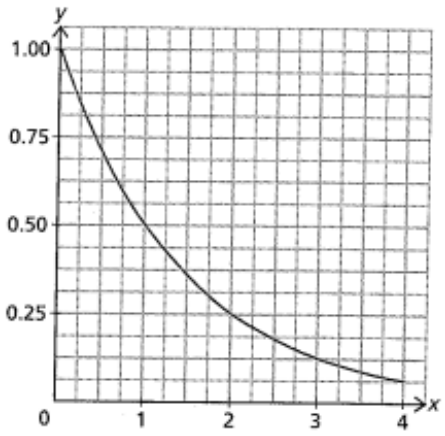


Growth $b > 1$

Ex: bacteria cultures
profit from investments

$y = (0.5)^x$

x	0	1	2	3	4
y	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$



Decay $0 < b < 1$

Ex: depreciation
radioactive decay

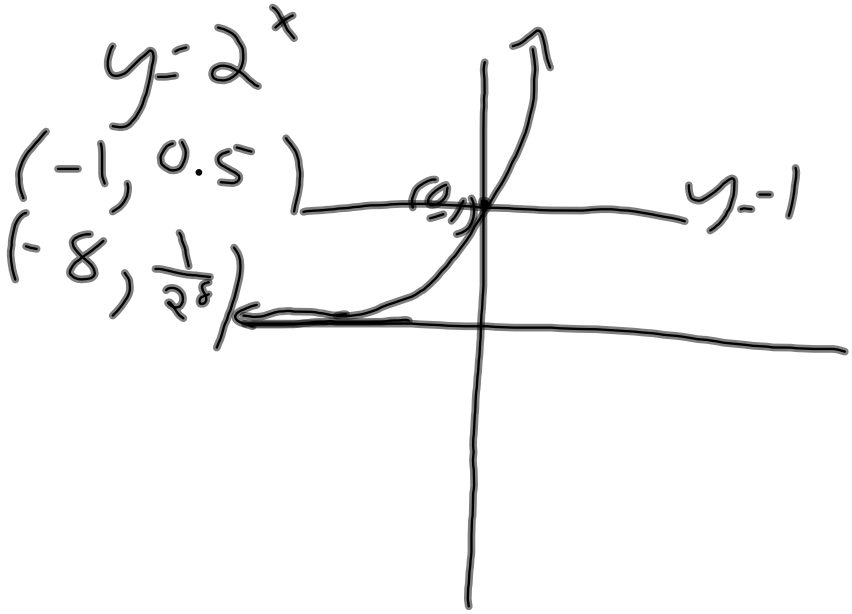
OTHER PROPERTIES:

- The Slopes of the tangent lines are changing along the curve

- There is a common ratio between successive y-values when the x-values change by the same increment.
  (Base of the function)

- The functions do not intersect the x-axis.
  (Horizontal Asymptote)

- They have the point (0,1) in common.
  (Initial Point)


y = 2^x
(-1, 0.5)
y = 1
(-∞, 1/2^∞)

Growth or Decay

a) $y = 37^x$

Growth

b) $y = 1/8^x$

Decay

c) $f(x) = 5^{-x}$

$5^{-1(x)}$

$(1/5)^x$

d) $f(x) = 16^{(-1/4)x}$

$\left(\frac{1}{16^{1/4}}\right)^x$

$= \left(\frac{1}{\sqrt[4]{16}}\right)^x$

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

Transformations of the Exponential Function

$$y = a(b)^x$$

intial value

base

check with...

Properties:

If $b > 1$, then the graph will be ·

If $0 < b < 1$, then the graph will be ·

y - intercept: happens when ·, so...