Exponential Functions

Notes #
Omega 2

Exponential curve: The graph of a function of the form $y = a^x$.

Definition of Irrational Exponents: If x is an irrational number and $a > 0$, then a^x is the real number between a^{x_1} and a^{x_2} for all possible choices of rational numbers x_1 and x_2, such that $x_1 < x < x_2$.

Exponential Function: A function of the form $y = a^x$, where *a* is a positive real number.

Annuity: A series of payments made at equal intervals of time.

Present Value of an Annuity:

The sum of the present values of all the periodic payments. P_n is the present value of an annuity, P is the dollars per payment, r is the interest rate, t is time in years, and n is the number of payments per year.

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

Future Value of an Annuity Formula:

The sum of all of the annuity payments plus any accumulated interest. F_n is the future value of an annuity, P is the dollars per payment, r is the interest rate, t is time in years, and n is the number of payments per year.

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

Ex A: Use a calculator to evaluate each expression to the nearest ten thousandth.

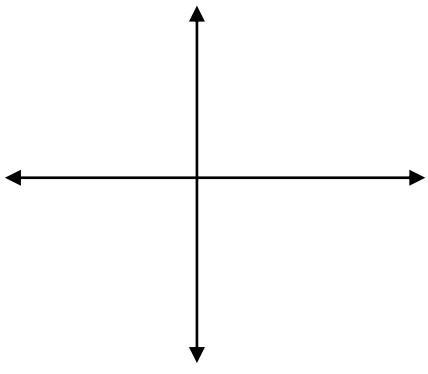
#1) $2^{\sqrt{6}}$ — #1

#2) $5^{\sqrt{2}}$ — #2

#3) $\left(\frac{1}{3}\right)^{\pi}$ — #3

Ex B: Graph each equation using the parent graph.

#1) $y = 2^x$



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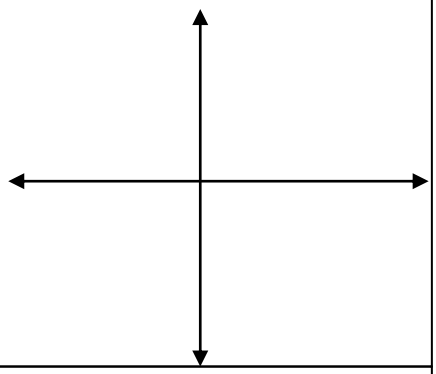
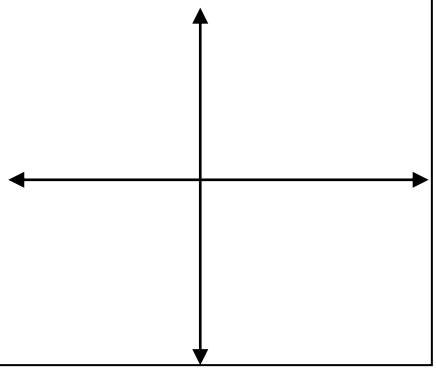
#2) $y = -2^x$



#3) $y = 2^{-x}$



Ex C: Compare and contrast the graphs from example #1, #2, and #3.

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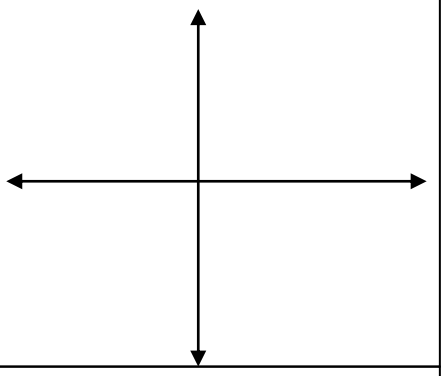
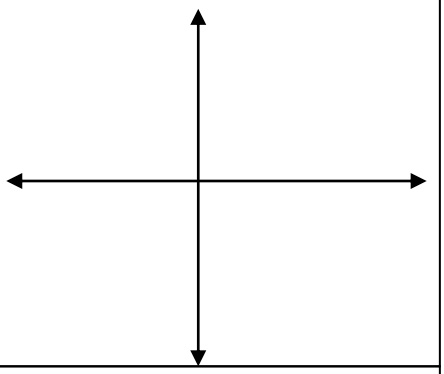
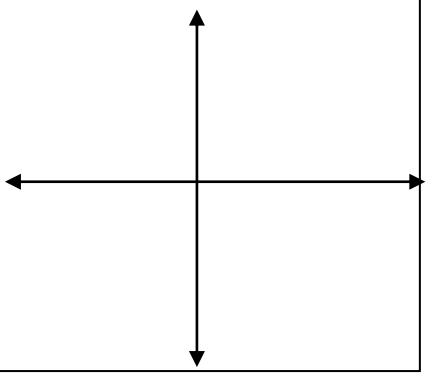
#1) $y < 2^x + 1$



#2) $y > -4^x$



#3) $y \leq 2^{x-4}$



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#1) A monthly mortgage payment consists of an amount paid toward the principal and the interest on the loan. (It may also contain an amount of the property taxes that the mortgage holder will pay from an escrow and an amount for insurance that protects the mortgage holder in case of default on the loan.) The Waltons have taken a 30-year mortgage for $100,000, with an interest rate of 9.0%, on their new home.

A) What will the monthly payment for the principal and interest be?

B) How much will the Waltons pay in interest over the life of the loan?

#2) When Jim Bob started his first job after he finished college, he opened an individual retirement account (IRA). He plans to contribute $2500 per year for 38 years until he reaches age 62. He hopes to earn an average APR of 8% over the 38-year period.

A) If Jim Bob contributes to his IRA at the rate that he plans, how much will his account be worth when he is 62 years old?

B) How much interest will be earned on the account?