Business Calculus Summer Review Packet

Welcome to Business Calculus!! To keep you prepared for Business Calculus in August, you must complete this packet in its entirety. It will be turned in for your first grade the first Friday of school. Prior to each review section, you will see a few example problems as well as a link to a video for additional help. A quiz on this material will be taken the first FULL week of school. Make sure to show all work and you may use a calculator, but steps MUST still be shown.

Topic #1: Find the equations of linear functions.

Helpful Video: Writing Linear Equations in all 3 Forms (Algebra I)

Finding Slope from 2 Points

Slope Formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Special Cases:

$\frac{0}{\#}$ → slope = 0 $\frac{\#}{0}$ → slope is undefined

Ex: Find the slope of the line that passes through the points (-9, -3) and (7, -7)

$m = \frac{-7-(-3)}{7-(-9)} = \frac{-4}{16} = \boxed{-\frac{1}{4}}$

Slope-Intercept Form

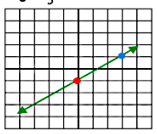
$y = mx + b$

m = slope & b = y-intercept

Graphing from Slope-Intercept Form:

1. Make a point at the y-intercept.
2. Use the slope $\left(\frac{\text{rise}}{\text{run}}\right)$ to make more points.
3. Connect the points to form a line.

Ex: Graph $y = \frac{2}{3}x - 1$



y-intercept is -1
slope = $\frac{2}{3}$, (so from the y-intercept go up 2 & right 3)

Standard Form

$Ax + By = C$

A, B, & C are integers & A is not negative

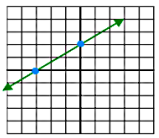
Graphing Using Intercepts:

1. Find the x-intercept by substituting 0 for y.
2. Find the y-intercept by substituting 0 for x.
3. Make a point at each intercept and then connect the points to form a line.

Ex: Graph $2x - 3y = -6$

x-intercept: $2x - 3(0) = -6$
$2x = -6$ → $x = -3$
(-3, 0)

y-intercept: $2(0) - 3y = -6$
$-3y = -6$ → $y = 2$
(0, 2)



1. **Solve the following from the ordered pairs $(3, 1)$ *and* $(-4, 2)$.**

a. Find the slope of the line that passes through the given points.

b. Find the point slope form of the equation of the line.

c. Find the slope-intercept form of the equation of the line.

d. Find the standard form of the equation of the line.

Topic 2: Find the domain for functions.

Polynomials (i.e. linear, quadratic, etc.)

Rational Functions

Radical (root) Functions

EXAMPLE

$f(x) = 2x$

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Our domain for this function will be all numbers and might contain:

$x = \{-1, 0, 1, 2, 3, 4, \dots\}$

And the range for this function will be all even numbers and will include 0:

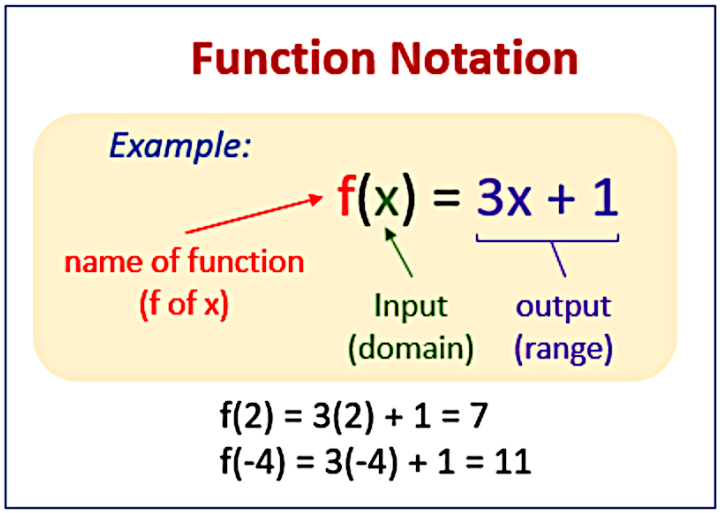
$y = \{-2, 0, 2, 4, 6, 8, \dots\}$

Examples of Limitations for Domain and Range	
Zero cannot be a denominator for a fraction $f(x) = \frac{x^2 + x - 2}{x^2 - 4x + 4}$	✓ We need to find which values of x would make the denominator equal to zero ✓ Set the bottom expression equal to zero and solve by factoring ✓ $(x-2)(x-2) = 0$ ✓ Thus, the domain of this function cannot include 2
The root of a negative number cannot be found $f(x) = \sqrt{-2x+3}$	✓ Our input cannot result in the root of a negative number, thus our outputs will all be greater than or equal to zero ✓ Exclude the root and set the expression greater than or equal to zero and solve ✓ $-2x + 3 \geq 0 \rightarrow x \leq \frac{3}{2}$ ✓ Thus, the domain of this function will be all inputs must be greater than or equal to $\frac{3}{2}$ and the range will be all outputs will be greater than or equal to zero

Find the domain of the following functions.

1. $f(x) = 4x - 1$	Domain:
2. $f(x) = \frac{x-2}{x+6}$	Domain:
3. $f(x) = -2x^2 + 4x - 9$	Domain:
4. $f(x) = \sqrt{-3x+5}$	Domain:
5. $f(x) = \frac{(x-9)(x+3)}{x^2-81}$	Domain:

Topic 3: Function Notation



1. **Given $f(x) = x^2 + 3x - 1$. Find the following.**

a. $f(1)$

b. $f(-1)$

c. $f(7)$

d. $f(a)$

e. $f(x + 3)$

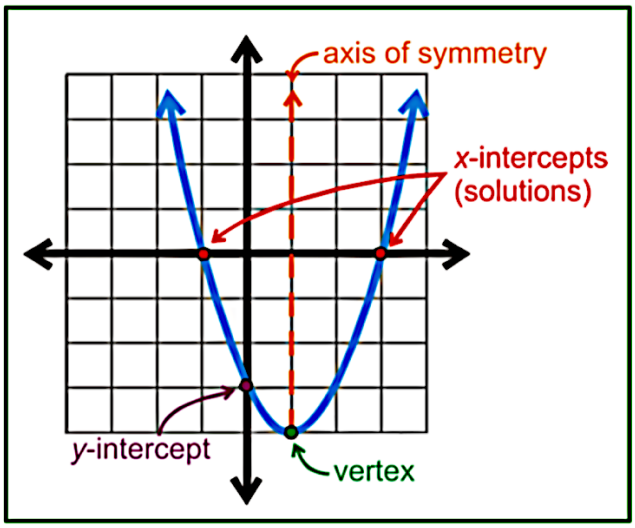
2. **Given $g(x) = x^2 + 2$. Find the following.**

a. $g(a + b)$

b. $g(x^2)$

Topic 4: Analyzing Quadratic Graphs

Helpful Video: Features of Quadratic Functions

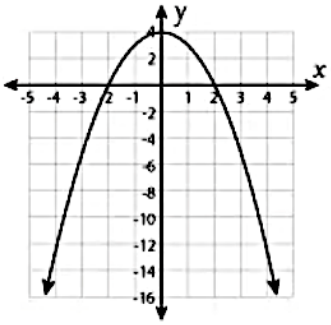


parabola

$f(x) = ax^2 + bx + c$ → **Minimum point (a>0)**

$f(x) = -ax^2 + bx + c$ → **Maximum point (a<0)**

1.



Domain: : _____

Range: : _____

x-intercepts : _____

y-intercept : _____

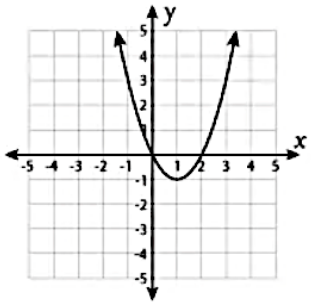
Vertex : _____

Maximum value : _____

Axis of symmetry : _____

Open up or down : _____

2.



Domain: : _____

Range: : _____

x-intercepts : _____

y-intercept : _____

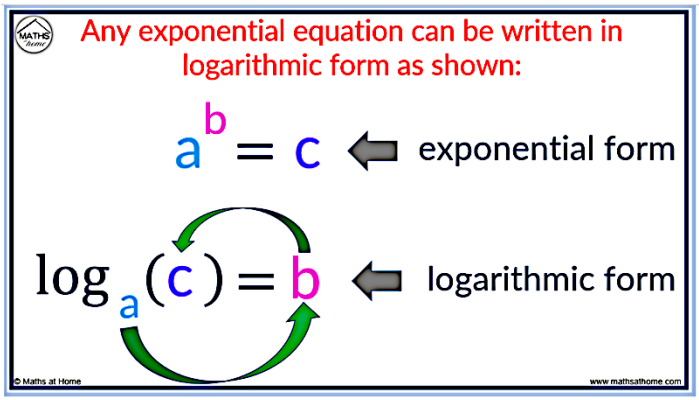
Vertex : _____

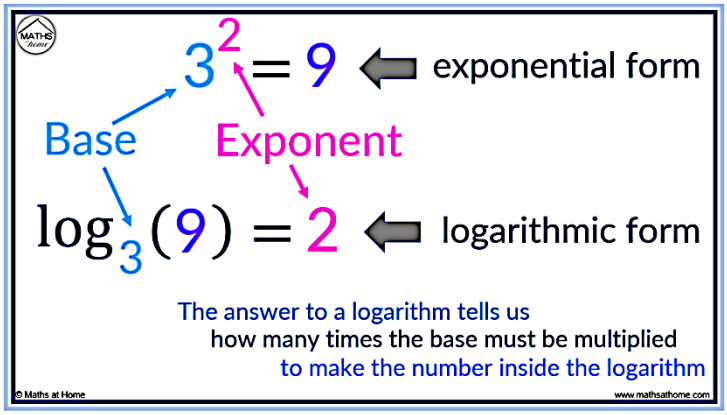
Maximum value : _____

Axis of symmetry : _____

Open up or down : _____

Topic 5: Converting back and forth from Exponential to Logarithmic Form



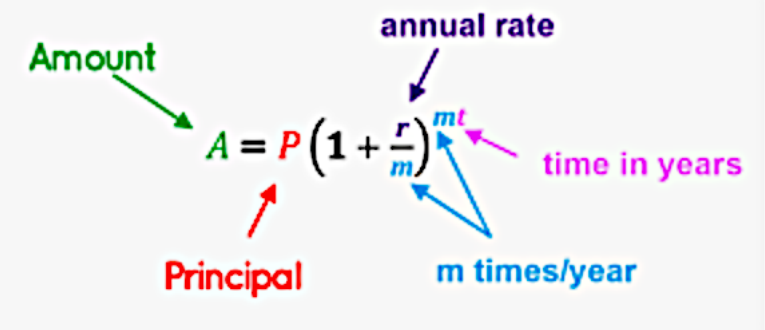


Convert from Exponential to Logarithmic form or Logarithmic Form to Exponential Form:

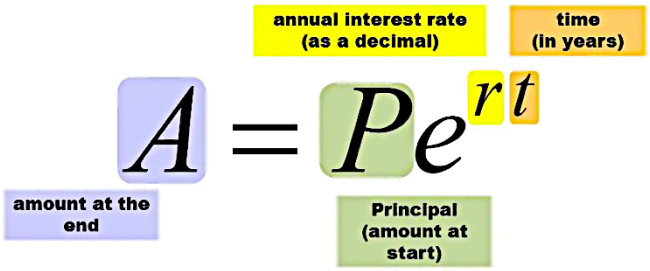
1. $\log_9 \frac{1}{81} = -2$	2. $\log_{169} 13 = \frac{1}{2}$
3. $\log_x y = 113$	4. $\log_n 117 = 11$
5. $14^2 = 196$	6. $\left(\frac{1}{6}\right)^3 = \frac{1}{216}$
7. $x^y = 101$	8. $3^n = 125$

Topic 6: Using Compound Interest and Continuously Compounded Interest Formulas

Compound Interest



CONTINUOUSLY COMPOUNDED INTEREST FORMULA



Sometimes you can have to solve for not just the amount the investment is worth at the end of the time period. If you're solving for values such as the time or the rate, you may need to use logarithm rules to move down your exponent. See the example below.

Helpful Video Link

Example: If you deposit $5000 into an account paying 6% annual interest compounded monthly, how long until there is $8000 in the account?

$8000 = 5000\left(1+\frac{0.06}{12}\right)^{12t}$	Plug in the giving information, FV = 8000, P = 5000, r = 0.06, and n = 12.
$8000 = 5000(1.005)^{12t}$	Use the order or operations to simplify the problem. Keep as many decimals as possible until the final step.
$1.6 = 1.005^{12t}$	Divide each side by 5000.
$\log(1.6) = \log(1.005^{12t})$ $\log 1.6 = (12t)(\log 1.005)$	Take the logarithm of each side. Then use Property 5 to rewrite the problem as multiplication.
$\frac{\log 1.6}{\log 1.005} = 12t$	Divide each side by log 1.005.
$94.23553232 \approx 12t$	Use a calculator to find log 1.6 divided by log 1.005.
$t \approx 7.9$	Finish solving the problem by dividing each side by 12 and round your final answer.

It will take approximately 7.9 years for the account to go from $5000 to $8000.

Problems:

1. Your investment of $1,200 gets 5.1% and is compounded semiannually for 7 1/2 years. What will your $1,200. be worth at the end of the term?

2. If you deposit $8000 into an account paying 7% annual interest compounded quarterly, how long until there is $12400 in the account?

3. At 3% annual interest compounded monthly, how long will it take to double your money?

4. Maria invests $6,154 in a savings account with a fixed annual interest rate of 8% compounded continuously. What will the account balance be after 10 years?

5. Anjali invests a sum of money in a retirement account with a fixed annual interest rate of 6.79% compounded continuously. After 20 years, the balance reaches $14,037.16. What was the amount of the initial investment?