Precalculus 5.3 Exponential Functions

Objective: able to evaluate & graph exponential functions; define *e*; solve exponential equations

An **Exponential Function** is a function of the form $f(x) = Ca^x$

where a is a positive real number ($a > 0$), $a \neq 1$, and $C \neq 0$

The domain of f is the set of all real numbers.

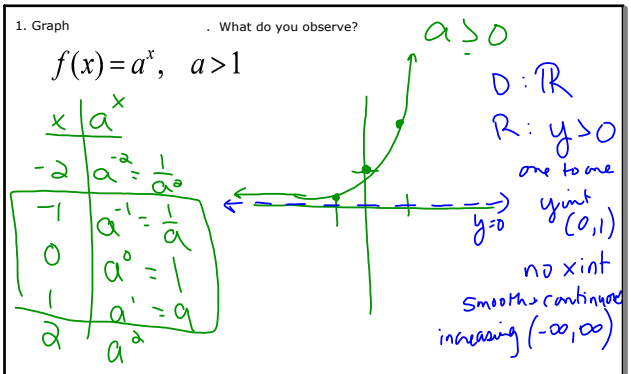
Why is $a > 0$ and $a \neq 1$?

$a = 1$ is a constant function

because you can't exclude any #'s from Domain $(-2)^x$ $-2^{\frac{1}{2}} = \sqrt{-2}$

Nov 18-12:13 PM

1. Graph $f(x) = a^x, \quad a > 1$. What do you observe?



2. Graph $f(x) = a^x, \quad 0 < a < 1$. What do you observe?

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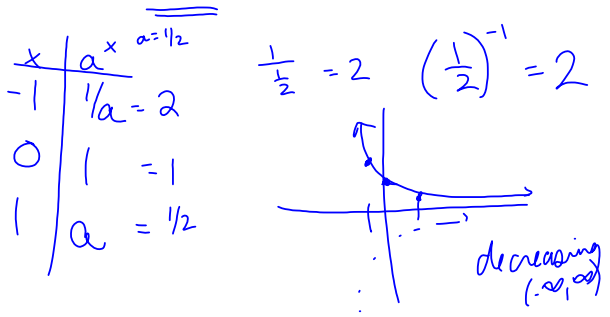

3. Graph $f(x) = 2^x$. Use transformations to graph $g(x) = -2^{x-1} + 3$

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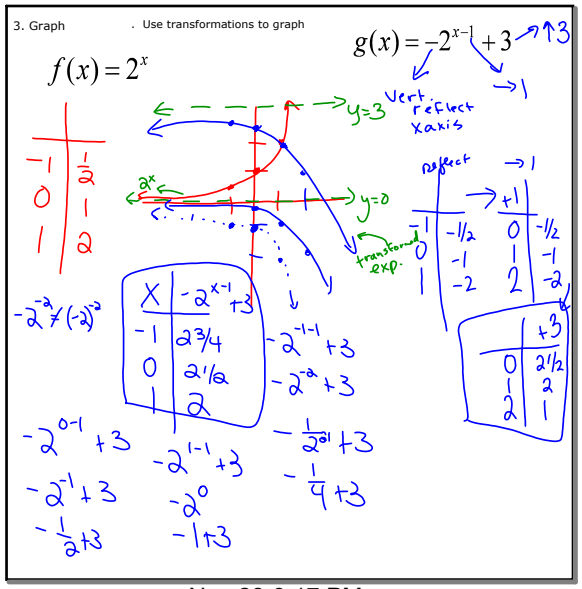

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1) the smaller the base the steeper the graph when $x < 0$

2) the smaller the base the less steep (more horizontal) the graph when $x > 0$

3) $-a^x$ reflection over x axis

4) a^{-x} reflection y axis (or $0 < a < 1$)

Nov 5-3:09 PM

$\left(1 + \frac{1}{n}\right)^n$

$n = 500$	$n = 1000$	$n = 5000$	$n = 50000$
2.716	2.717	2.718	2.718

$e \approx 2.718$

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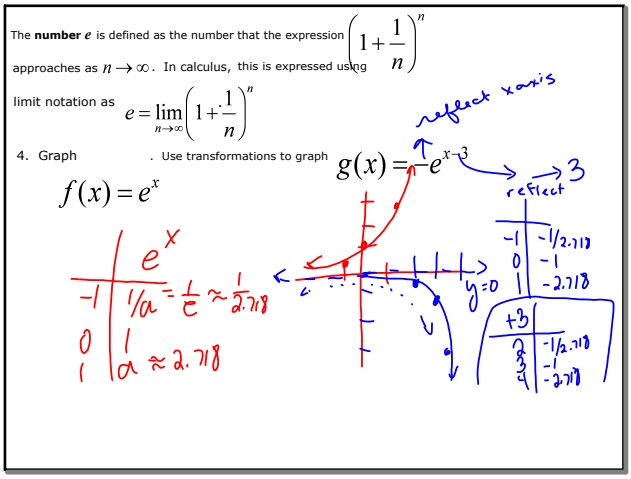
The **number** e is defined as the number that the expression $\left(1+\frac{1}{n}\right)^n$ approaches as $n \to \infty$. In calculus, this is expressed using limit notation as $e = \lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n$

4. Graph $f(x) = e^x$. Use transformations to graph $g(x) = -e^{x-3}$



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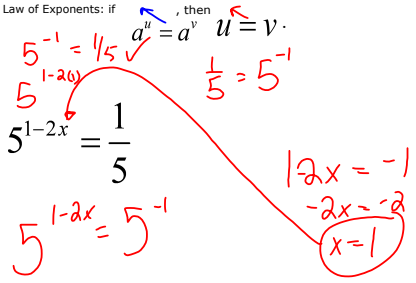
Equations that involve terms of the form $a^x, a>0, a\neq 1$, are often referred to as exponential equations. Solving these equations requires applying the following Law of Exponents: if $a^u = a^v$, then $u = v$.

5. Solve: $5^{1-2x} = \frac{1}{5}$



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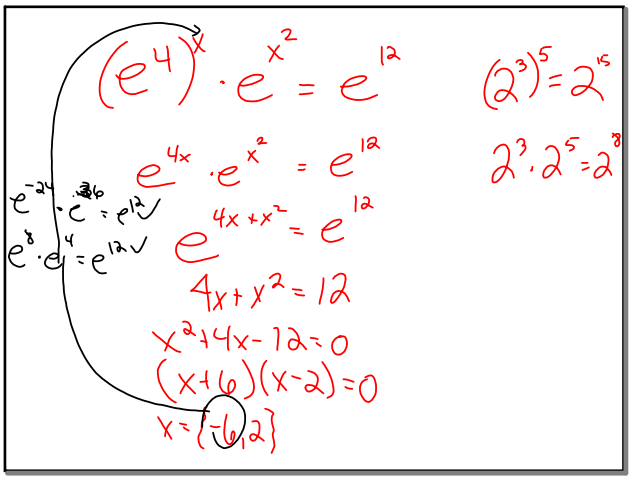

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6. Between 5:00p and 6:00p, cars arrive at Jiffy Lube at the rate of 9 cars per hour (0.15 cars per minute). The following formula from statistics can be used to determine the exponential probability that a car will arrive within t minutes of 5:00p.

$F(t) = 1 - e^{-0.15t}$

a. Determine the probability that a car will arrive within 15 minutes of 5:00p (that is, before 5:15p).

$f(15) = 1 - e^{-.15(15)} \approx .895 = 89.5\%$ (15, .895)

b. Determine the probability that a car will arrive within 30 minutes of 5:00p (that is, before 5:30p).

$f(30) = 1 - e^{-.15(30)} \approx .989 = 98.9\%$ (30, .989)

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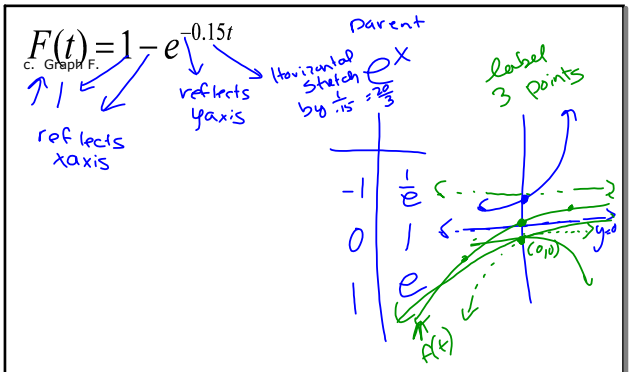
$F(t) = 1 - e^{-0.15t}$

c. Graph F.



d. What value does F approach as t becomes unbounded in the positive direction? 1

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Rate yourself on how well you understood this lesson.

I don't get it at all	I sort of get it	I understand most, but I need more practice	I understand it pretty well	I got it!!
1	2	3	4	5

What I still need to work on....

Aug 24-10:50 AM