Warm Up

1. a) $9\left(2^{3x+5}\right)-8=28$

$\frac{9(2^{3x+5})}{9}=\frac{36}{9}$

$2^{3x+5}=4$

$2^{3x+5}=2^2$

$3x+5=2$

$3x=-3$

$x=-1$

b) $\frac{16^{2x-1}}{8^{x+2}}=\left(\frac{1}{4}\right)^{3x+1}$

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

$\frac{2^{8x-4}}{2^{3x+6}}=2^{-6x-2}$

$(8x-4)-(3x+6)$

$2^{5x-10}=2^{-6x-2}$

$5x-10=-6x-2$

$11x=8$

$x=\frac{8}{11}$

2. 1

Determine the *y*-intercept, the equation of the horizontal asymptote and state whether the function grows or decays:

$y=3(2^{-x})+4$

Decay

$y=3(2^{-11x})+4$

y int $(0,7)$

$y=4$

Applications of Exponential Functions

Leo buys a minivan for $24 000. The vehicle depreciates by 18% each year

a) Set up a table of values to show the van's value for the first four years.

$y = a(b)^t$

years	Beginning	1	2	3
Value	24000	19680	16137	13233

C.R.

b) Find the common ratio for the successive terms

0.82

c) Explain why the value of the minivan with respect to time can be modeled using an exponential function

$y = 24000(0.82)^t$

Applications of Exponential Functions

John bought a motorcycle for $3000. It depreciates by 15% of its value each year.

a) Complete the table:

x · .85 · .85

x	Years	0	1	2	3
y	Value of Motorcycle ($)	3000	2550	2168	1842

b) Determine a function that describes the value of the motorcycle in terms of the number of years since it was purchased.
(Must be done without the assistance of a TI-83)

$y = a(b)^x$

$y = 3000(0.85)^x$

Applications cont'd

The amount of ASA in your bloodstream decreases exponentially with time. The following formula describes the amount of ASA in a typical patient's bloodstream in $\mu g/cm^3$ in terms of time in hours after the peak dosage: $A = 40(0.758)^t$

a) What is the peak dosage of ASA in the bloodstream? $40\ \mu g/cm^3$

b) How much would be left in the patient's system:

I. 5h after peak dosage

$A = 40(0.758)^5 = 10.009\ \mu g$

II. 7h 15mins after peak dosage

$A = 40(0.758)^{7.25}$ $\frac{60\ min}{1\ h}$ $\frac{15}{60} = 0.25$

$= 5.366\ \mu g$

Applications cont'd

$y = a(b)^x$

Mrs. Mutch invested $200 in a Guaranteed Investment Certificate (GIC) that paid 6% interest per year. Find the equation of the function that describes that amount of money she has in the GIC in terms of time in years *without using technology*. How much will she have in 12 years?

$y = 200(1.06)^x$

$y = 200(1.06)^{12}$

$y = \$402.4$

Applications cont'd

Mr. Hallihan invested $1000 in a GIC. He was able to find a few of his monthly bank statements for the GIC:

Month	0	3	10	15	21
Value ($)	1000	1030.30	1104.62	1160.97	1232.39

Find the amount he will have interested after three years.

$y = 1000(1.03)^{\frac{t}{3}}$

$y = 1000(1.072)^{\frac{t}{3}}$

$y = 1000(103)^{\frac{36}{3}} = 1430$

$y = 1000(1.072)^{\frac{36}{3}} = 1430$

Applications cont'd

Mr. Stewart purchased and autographed jersey signed by Felix Potvin for $175 in 1995. If the jersey doubled in value every five years, what would it be worth in 2022?

$y = 175(2)^{\frac{x}{5}}$

$y = 175(2)^{\frac{27}{5}}$

$y = \$7389.24$

Applications cont'd

Mr. Svarc asked two students to find the equation of the exponential function for the following situation:

> The initial concentration of bacteria in a Petri dish was 300 bacteria/mm^2. The population doubled every 15 minutes.

Two students gave the following answers:

Chester's answer: $\mathbf{y = 300(2)^{x/15}}$

Abigail's answer: $\mathbf{y = 300(2)^{4x}}$

Chester said he worked in minutes and Abigail said she worked in hours. Whose answer is correct or are they both correct?

Problem?

We can solve:

$$4^{2x} = 2^4$$
$$2^{2(2x)} = 2^4$$
$$2^{4x} = 2^4$$
$$4x = 4$$
$$x = 1$$

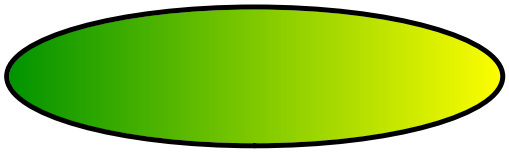
But, what if?

$$3^x = 17$$

or

$$5^x = 23$$

How would we solve these equations?



Logarithms!

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#33 (a - c)
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#39

#26. $y = 5(1.2)^x$ *OR* $y = 5(3)^{\frac{x}{2}}$ *OR* $y = 5(9)^{\frac{x}{12}}$

#27. $78.11

#28. Initial - 4.22
Base - 2 (double)
Increment - every 16 years (2006 - 1990)

#29. Both are correct

#30. *a)* $y = 12(3)^{\frac{x}{2}}$

b) $y = 48\left(\frac{1}{2}\right)^{\frac{x}{3}}$

c) $y = 3(2)^{\frac{x}{4}}$

d) $y = 60(2)^{10x}$

e) $y = 6\left(\frac{1}{3}\right)^{5x}$

#31. a) 300 bacteria/cm^2
b) 20 min
c) 1697 bacteria/cm^2

#32. missing *x*-values: 12 & 18
missing *y*-values: 86.05 & 120.47

#33. *a)* $y = 0.87(0.82)^x$

b) $y = 0.87(0.76)^x$

c) $0.41\ candela/cm^2$

#34. *a)* $y = 2.8\left(\frac{1}{2}\right)^{\frac{x}{5750}}$

b) $0.66\ mg$

#35. $1414. 21 (wrong assumption)

#36. *a)* $y = 3500(0.629)^{\frac{x}{2}}$

b) Day 1 - 3500
Day 2 - 2200
Day 3 - 1384

c) 691 frogs

#39. $283 000