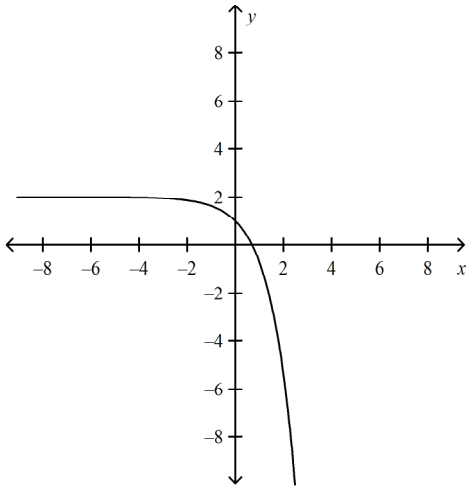
Name: _____ **Class:** _____ **Date:** _____ **ID: A**

Algebra II Practice Quiz 7.6 - 7.8

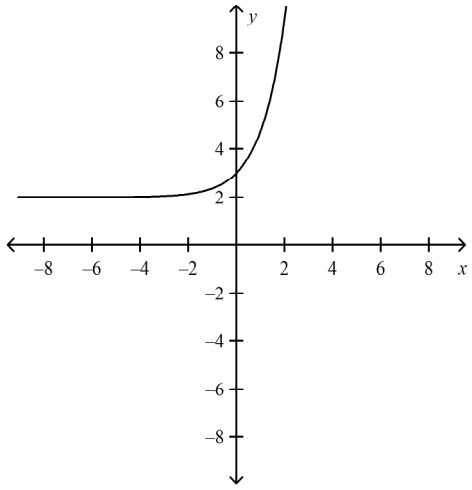
Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Graph $f(x) = e^x + 2$.

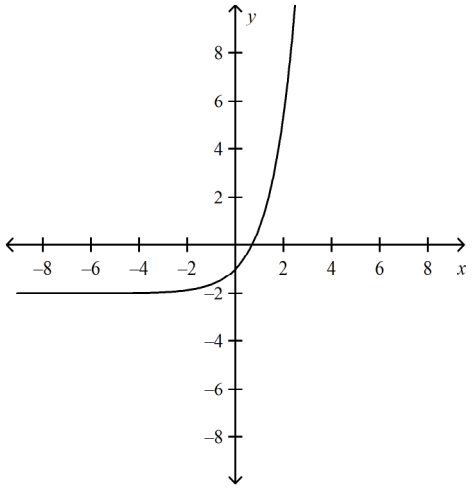
a.



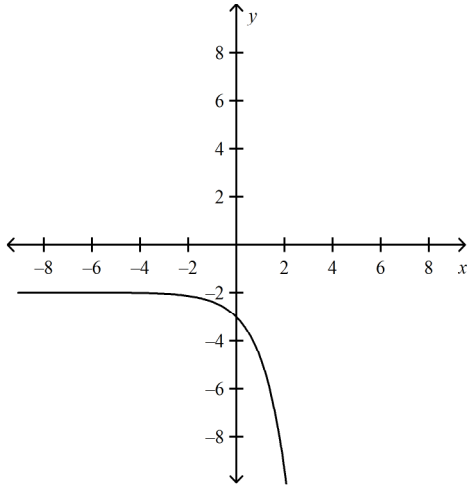
c.



b.



d.



____ 2. Simplify $\ln e^{-5x}$.

a. e^{-5}
c. $-5x$
b. -5
d. e^{-5x}

____ 3. Nadav invests $6,000 in an account that earns 5% interest compounded continuously. What is the total amount of her investment after 8 years? Round your answer to the nearest cent.

a. $8950.95
c. $9850.95
b. $327,588.90
d. $14,950.95

____ 4. Radioactive iodine treatment is so successful at treating hyperthyroidism that it has virtually replaced thyroid surgery. To the nearest full day, determine how long it will take for 400 millicuries of I-131, which has a half-life of 8 days, to decay to 3.125 millicuries.

a. 56 days
c. 128 days
b. 7 days
d. 8 days

____ 5. What expression is equal to $\log 50$?

a. $\ln 50$
b. $\ln 50 - \ln 10$
c. $\ln 50 \div \ln 10$
d. $\ln(50 \div 10)$

____ 6. Determine whether f is an exponential function of x of the form $f(x) = ab^x$. If so, find the constant ratio.

x	-1	0	1	2	3
$f(x)$	$1.1\overline{6}$	3.5	10.5	31.5	94.5

a. The second differences are not constant. The data set is not exponential.
b. The data set is exponential with a constant ratio of $2.\overline{3}$.
c. The ratio of the successive first differences is constant. $f(x)$ is a linear function of x.
d. The data set is exponential with a constant ratio of 3.

____ 7. The table shows US Department of Agriculture estimates of the number of acres defoliated by gypsy moths in Massachusetts during the years 1978 to 1981, the first four years of a major gypsy moth epidemic. Find an exponential model for the data. Use the model to predict the number of thousands of acres defoliated by gypsy moths in 1982, the fifth year of the epidemic.

Epidemic Year	**Thousands of Acres**
1	63
2	226
3	907
4	2,826

a. $A(y) = 50.97y^{2.70}$; 3931
b. $A(y) = 439y^2 - 1298y + 958$; 5443
c. $A(y) = 17.82(3.60)^y$; 10,775
d. $A(y) = 897y - 1237$; 3248

____ 8. The table shows the growth in the population of lemurs on an island over a 5-year period. Find a natural log model for the data, rounding your a- and b-values to the nearest hundredth.
Use the model to predict the year in which the lemur population will reach 500.

Population	222	292	340	366	382
Year	1	2	3	4	5

a. $P(t) = 223.08 + 101.64 \ln t$; year 15
b. $P(t) = 101.64 + 223.08 \ln t$; year 6
c. $P(t) = 202.2 + 39.4t$; year 7
d. $P(t) = 221.46 + 105.15 \ln t$; year 14

Numeric Response

9. Find the missing value if f is an exponential function. Round your answer to the nearest hundredth.

x	0	1	2	3
$f(x)$	6	9	?	20.25

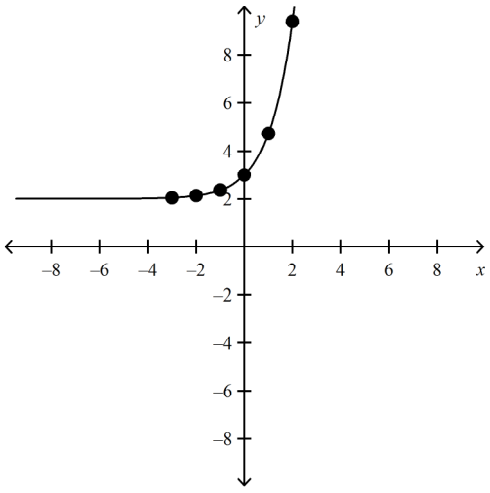
Algebra II Practice Quiz 7.6 - 7.8
Answer Section

MULTIPLE CHOICE

1. ANS: C

Make a table. Because e is irrational, round the values.

x	−3	−2	−1	0	1	2	3
$f(x) = e^x + 2$	2.05	2.14	2.37	3	4.72	9.39	22.09



	Feedback
A	Make a table to check your values.
B	Make a table to check your values.
C	Correct!
D	Make a table to check your values.

PTS: 1 DIF: Basic REF: Page 531
OBJ: 7-6.1 Graphing Exponential Functions NAT: 12.5.1.e
TOP: 7-6 The Natural Base e

2. ANS: C

$\ln e^{-5x} = -5x \ln e = -5x(1) = -5x$

	Feedback
A	Use the inverse property of ln.
B	Remember the variable.
C	Correct!
D	Use the inverse property of ln.

PTS: 1 DIF: Basic REF: Page 532
OBJ: 7-6.2 Simplifying Expressions with e or ln TOP: 7-6 The Natural Base e

3. ANS: A

$A = Pe^{rt}$ Substitute 6,000 for P, 0.05 for r, and 8 for t.

$A = 6000e^{0.05(8)}$ Use the [e^x] key on a calculator.

$A \approx 8950.95$

The total amount after 8 years is $8950.95.

	Feedback
A	Correct!
B	5% = 0.05
C	Check the answer on your calculator.
D	Use the formula for continuously compounded interest. Don't add 6000.

PTS: 1 DIF: Average REF: Page 532 OBJ: 7-6.3 Application
NAT: 12.5.1.e TOP: 7-6 The Natural Base e

4. ANS: A

Step 1 Find the decay constant for ^{131}I.

$N_t = N_0 e^{-kt}$	Use the natural decay function.
$\frac{1}{2} = 1e^{-k8}$	Substitute 1 for N_0, 8 for t, and $\frac{1}{2}$ for N_t because half the initial quantity will remain.
$\ln\left(\frac{1}{2}\right) = \ln\left(e^{-8k}\right)$	Simplify and take the ln of both sides.
$\ln\left(2^{-1}\right) = -8k$	Write $\frac{1}{2}$ as 2^{-1}, and simplify the right side.
$-\ln 2 = -8k$	Properties of logarithms
$k = \frac{\ln 2}{8} \approx 0.08664$	

Step 2 Write the decay function and solve for t.

$N_t = N_0 e^{-0.08664t}$	Substitute 0.08664 for k.
$3.125 = 400e^{-0.08664t}$	Substitute 3.125 for N_t and 400 for N_0.
$0.007813 = e^{-0.08664t}$	Divide both sides by 400.
$\ln(0.007813) = \ln\left(e^{-0.08664t}\right)$	Take the ln of both sides.
$\ln(0.007813) = -0.08664t$	Simplify.
$t = \frac{\ln(0.007813)}{-0.08664} \approx 56$	

It will take approximately 56 days for 400 millicuries of I-131 to decay to 3.125 millicuries.

	Feedback
A	Correct!
B	You found the number of half-lives? How many days comprise 7 half-lives?
C	Use what you know about the half-life to find k for the decay of I-131. Then find the time t it takes for 400 millicuries to decay to 3.125 millicuries.
D	Use what you know about the half-life to find k for the decay of I-131. Then find the time t it takes for 400 millicuries to decay to 3.125 millicuries.

PTS: 1 DIF: Average REF: Page 533 OBJ: 7-6.4 Application
TOP: 7-6 The Natural Base e

5. ANS: C
Use the change of base formula.
$\log 50 = \log_{10} 50 = \dfrac{\ln 50}{\ln 10} = \ln 50 \div \ln 10$

	Feedback
A	Use the change of base formula.
B	Use the change of base formula.
C	Correct!
D	Use the change of base formula.

PTS: 1 DIF: Advanced TOP: 7-6 The Natural Base e

6. ANS: D
Compute the first differences.

x	–1	0	1	2	3
$f(x)$	$1.1\overline{6}$	3.5	10.5	31.5	94.5

First differences: $2.\overline{3}$ 7 21 63

The ratios of the first differences are $\frac{63}{21} = \frac{21}{7} = \frac{7}{2.\overline{3}} = 3$. Thus the data set is exponential with a constant ratio of 3.

	Feedback
A	Compute the ratios, not the differences, of the first differences.
B	This is the first difference for the values of $f(x)$ at $x = -1$ and $x = 0$. To find the constant ratio, compute the ratio of the successive first differences.
C	$f(x)$ is linear if the first differences are constant. $f(x)$ is exponential if $f(x)$ is not linear and the ratios of the first differences are constant.
D	Correct!

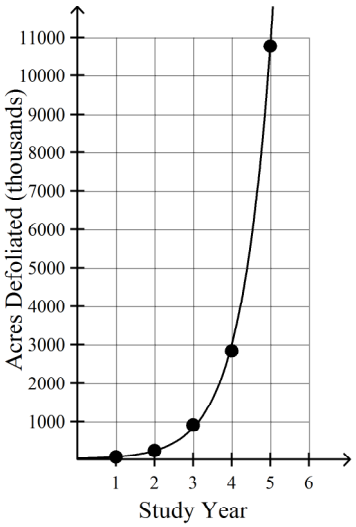
PTS: 1 DIF: Average REF: Page 545 OBJ: 7-8.1 Identifying Exponential Data
NAT: 12.5.2.g TOP: 7-8 Curve Fitting with Exponential and Logarithmic Models

7. ANS: C

Step 1 Enter the data into two lists in a graphing calculator. Use the exponential regression feature: [STAT] > CALC > 0: ExpReg.

An exponential model is $A(y) = 17.82(3.60)^{y}$, where A is the number of thousands of acres defoliated by gypsy moths and y is number of years since the beginning of the epidemic.

Step 2 Graph the data and the model function to verify that it fits the data.



Step 3 Enter 5 for *X1* and use the intersection feature to find y when *X1* is 5. You might need to expand the window to find the intersection. The model predicts 10,775 thousands of acres were defoliated by gypsy moths in 1982.

The actual value was 1,383. That year a viral infection in the gypsy moth population reduced their numbers dramatically.

	Feedback
A	Use the exponential regression feature to find a function of the form $A(y) = a(b^{\wedge}y)$.
B	Use the exponential regression feature to find a function of the form $A(y) = a(b^{\wedge}y)$.
C	Correct!
D	Use the exponential regression feature to find a function of the form $A(y) = a(b^{\wedge}y)$.

PTS: 1 DIF: Average REF: Page 546 OBJ: 7-8.2 Application
NAT: 12.5.2.g TOP: 7-8 Curve Fitting with Exponential and Logarithmic Models

8. ANS: A
Put the population values in a *y*-list and the years in the *x*-list of a graphing calculator. Perform a natural log regression.

The regression equation is $P(t) = 223.08 + 101.64 \ln t$.

Find the *t*-value where the graphs of $P(t)$ and $y = 500$ intersect. They intersect when $t \approx 15$.

So the lemur population will reach 500 in approximately 15 years.

	Feedback
A	Correct!
B	Check the positions of the *a*- and *b*-values in your regression equation.
C	This is a linear model. Use a natural log model.
D	Be sure to use all of the data in the table.

PTS: 1 DIF: Average REF: Page 547 OBJ: 7-8.3 Application
NAT: 12.5.2.g TOP: 7-8 Curve Fitting with Exponential and Logarithmic Models

NUMERIC RESPONSE

9. ANS: 13.5

PTS: 1 DIF: Advanced NAT: 12.5.1.e
TOP: 7-8 Curve Fitting with Exponential and Logarithmic Models