Student: ______________ **Date:** ______________	**Instructor:** Andreas Lazari **Course:** Math1111-Summer2018	**Assignment:** Section 4.1 Homework

1. Approximate the number using a calculator.

$9^{1.7}$

$9^{1.7} \approx$ 41.900 (Round to three decimal places.)

9^1.7 ≈ 41.900

2. Approximate the following number using a calculator.

$5^{-1.4}$

$5^{-1.4} \approx$ 0.105 (Round to three decimal places as needed.)

5^-1.4 ≈ 0.105

3. Approximate the number using a calculator.

$e^{-0.71}$

$e^{-0.71} \approx$ 0.492 (Round to three decimal places.)

e^(-.71) = .491644 ≈ 0.492

4. Graph the given function by making a table of coordinates.

$f(x) = 2^x$

$f(-2) = 2^{-2} = \frac{1}{4}$ | $f(0) = 2^0 = 1$

$f(-1) = 2^{-1} = \frac{1}{2}$ | $f(1) = 2^1 = 2$

$f(2) = 2^2 = 4$

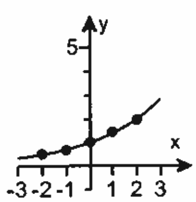
Complete the table of coordinates.

x	−2	−1	0	1	2
y	1/4	1/2	1	2	4

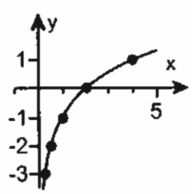
(Type integers or fractions. Simplify your answers.)

Choose the correct graph below.

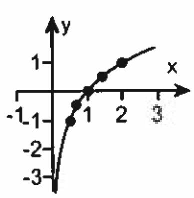
○ **A.**



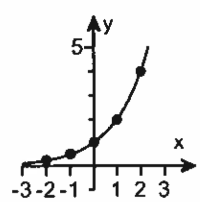
○ **B.**



○ **C.**



● **D.**



5. Graph the given function by making a table of coordinates.

$f(x) = \left(\frac{1}{3}\right)^x$

$f(-2) = \left(\frac{1}{3}\right)^{-2} = 9$
$f(-1) = \left(\frac{1}{3}\right)^{-1} = 3$
$f(0) = \left(\frac{1}{3}\right)^{0} = 1$
$f(1) = \left(\frac{1}{3}\right)^{1} = \frac{1}{3}$
$f(2) = \left(\frac{1}{3}\right)^{2} = \frac{1}{9}$

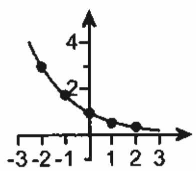
Complete the table of coordinates.

x	-2	-1	0	1	2
y	9	3	1	1/3	1/9

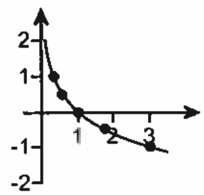
(Type integers or fractions. Simplify your answers.)

Choose the correct graph below.

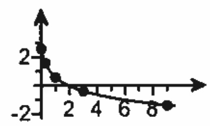
○ A.



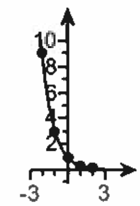
○ B.



○ C.

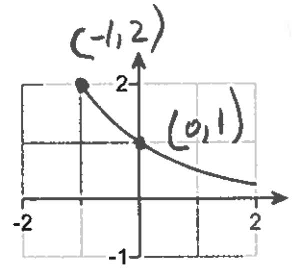


● D.



6. Match the graph to one of the following functions.

$y = 2^x$ $\quad$ $y = 2^{-x}$
$y = -2^x$ $\quad$ $y = -2^{-x}$
$y = 2^x - 1$ $\quad$ $y = 2^{x-1}$
$y = 2^{1-x}$ $\quad$ $y = 1 - 2^x$

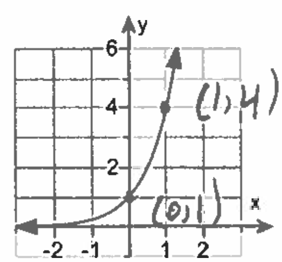


Which function is represented by the graph?

○ A. $y = 2^x$
○ B. $y = -2^{-x}$
○ C. $y = 2^{1-x}$
○ D. $y = 1 - 2^x$
○ E. $y = 2^x - 1$
○ F. $y = -2^x$
● G. $y = 2^{-x}$
○ H. $y = 2^{x-1}$

7. The graph of an exponential function is given to the right. Select the function for the graph from the following options.

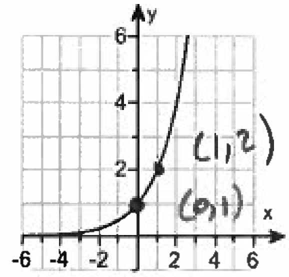
$f(x) = 4^x$, $g(x) = 4^{x-1}$, $h(x) = 4^x - 1$,
$F(x) = -4^x$, $G(x) = 4^{-x}$, $H(x) = -4^{-x}$



Which function is represented by the graph?

○ A. $H(x) = -4^{-x}$
○ B. $g(x) = 4^{x-1}$
○ C. $F(x) = -4^x$
○ D. $h(x) = 4^x - 1$
● E. $f(x) = 4^x$
○ F. $G(x) = 4^{-x}$

8. The graph of an exponential function is given. Select the function for the graph.

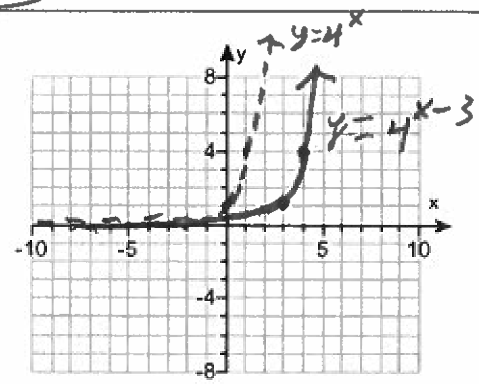


Identify the function.

○ A. $f(x) = 2^{-x}$ ○ B. $f(x) = 2^x - 1$ ● C. $f(x) = 2^x$ ○ D. $f(x) = 2^{x-1}$

9. Use transformations of the graph of $f(x) = 4^x$ to graph the function g(x) given below. Graph and give the equation of the asymptote. Use the graph to determine the domain and range of g(x). shift: 3 units to the right

$g(x) = 4^{x-3}$



Graph the function $g(x) = 4^{x-3}$ and its asymptote. Graph the asymptote as a dashed line. Use the graphing tool to graph the function.

What is the equation of the horizontal asymptote of $g(x) = 4^{x-3}$?

y = 0

What is the domain of $g(x) = 4^{x-3}$?

$(-\infty, \infty)$

(Type your answer in interval notation.)

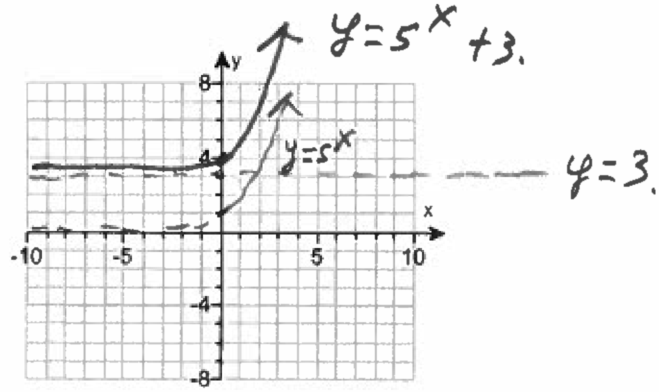
What is the range of $g(x) = 4^{x-3}$?

$(0, \infty)$

(Type your answer in interval notation.)

10. Use transformations of the graph of $f(x) = 5^x$ to graph the function g(x) given below. Graph and give the equation of the asymptote. Use the graph to determine the domain and range of g(x). Shift 3 units up.

$g(x) = 5^x + 3$



Graph the function $g(x) = 5^x + 3$ and its asymptote. Graph the asymptote as a dashed line. Use the graphing tool to graph the function.

What is the equation of the horizontal asymptote of $g(x) = 5^x + 3$?

y = 3

What is the domain of $g(x) = 5^x + 3$?

$(-\infty, \infty)$

(Type your answer in interval notation.)

What is the range of $g(x) = 5^x + 3$?

$(3, \infty)$.

(Type your answer in interval notation.)

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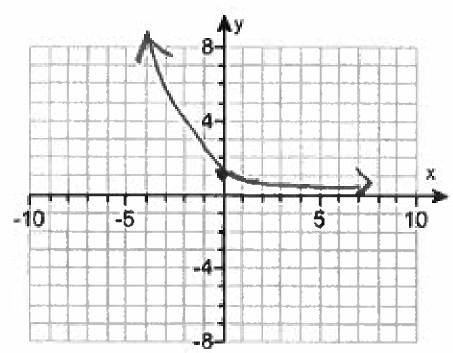
11. Use transformations of the graph of $f(x) = 7^x$ to graph the given function. Be sure to graph and give the equation of the asymptote. Use the graphs to determine the function's domain and range.

$g(x) = 7^{-x} = \left(\frac{1}{7}\right)^x$



Graph the function $g(x) = 7^{-x}$ and its asymptote. Graph the asymptote as a dashed line. Use the graphing tool to graph the function.

What equation represents the asymptote of $g(x) = 7^{-x}$?

$y = 0$

(Type an equation.)

What is the domain of $g(x) = 7^{-x}$?

$(-\infty, \infty)$

(Type your answer in interval notation.)

What is the range of $g(x) = 7^{-x}$?

$(0, \infty)$

(Type your answer in interval notation.)

12. Use the compound interest formulas $A = P\left(1+\frac{r}{n}\right)^{nt}$ and $A = Pe^{rt}$ to solve the problem given. Round answers to the nearest cent.

Find the accumulated value of an investment of $15,000 for 6 years at an interest rate of 6% if the money is **a.** compounded semiannually; **b.** compounded quarterly; **c.** compounded monthly **d.** compounded continuously.

a. What is the accumulated value if the money is compounded semiannually?

$A = 15000\left(1+\frac{.06}{2}\right)^{2(6)} = 21386.4133$

$ 21386.41 (Round your answer to the nearest cent.)

b. What is the accumulated value if the money is compounded quarterly? $A = 15000\left(1+\frac{.06}{4}\right)^{4(6)} = 21442.54218$

$ 21442.54 (Round your answer to the nearest cent.)

c. What is the accumulated value if the money is compounded monthly? $A = 15000\left(1+\frac{.06}{12}\right)^{12(6)} = 21480.66418$

$ 21480.66 (Round your answer to the nearest cent.)

d. What is the accumulated value if the money is compounded continuously?

$A = 15000\,e^{.06(6)} = 21499.94122.$

$ 21499.94 (Round your answer to the nearest cent.)

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13. Use a calculator with a $\boxed{y^x}$ key or a $\boxed{\wedge}$ key to solve the following.

The exponential function $f(x) = 563(1.026)^x$ models the population of a country, f(x), in millions, x years after 1974. Complete parts (a) – (e).

a. Substitute 0 for x and, without using a calculator, find the country's population in 1974.

The country's population in 1974 was 563 million.

b. Substitute 27 for x and use your calculator to find the country's population, to the nearest million, in the year 2001 as modeled by this function.

$f(27) = 563(1.026)^{27} = 1125.8671$

≈ 1126

The country's population in 2001 was 1126 million.

c. Find the country's population, to the nearest million, in the year 2028 as predicted by this function.

From 1974 to 2028 is 54 years; $X = 54$.

The country's population in 2028 will be 2251 million.

$f(54) = 563(1.026)^{54} = 2251.4685$

d. Find the country's population, to the nearest million, in the year 2055 as predicted by this function.

From 1974 to 2055 is 81 years.

The country's population in 2055 will be 4502 million.

$f(81) = 563(1.026)^{81} = 4502.405$

e. What appears to be happening to the country's population every 27 years?

- ● **A.** It appears that the population is growing by a factor of 2 every 27 years.
- ○ **B.** It appears that the population is decreasing by a factor of $\frac{1}{2}$ every 27 years.
- ○ **C.** There does not appear to be a pattern.
- ○ **D.** It appears that the population is growing by a factor of 3 every 27 years.

14. The 1981 explosion at a nuclear lab sent about 1000 kilograms of a radioactive element into the atmosphere. The function $f(x) = 1000(0.5)^{\frac{x}{30}}$ describes the amount, f(x), in kilograms, of a radioactive element remaining in the area x years after 1981. If even 100 kilograms of the radioactive element remains in the atmosphere, the area is considered unsafe for human habitation. Find f(70) and determine if the area will be safe for human habitation by 2051.

f(70) ≈ 198.4 (Type an integer or a decimal rounded to the nearest tenth as needed.)

$f(70) = 1000(.5)^{\frac{70}{30}} = 198.4251$

Will the area be safe for human habitation by 2051?

- ○ **A.** Yes, because by 2051, the radioactive element remaining in the area is less than 100 kilograms.
- ○ **B.** No, because by 2051, the radioactive element remaining in the area is less than 100 kilograms.
- ○ **C.** Yes, because by 2051, the radioactive element remaining in the area is greater than 100 kilograms.
- ● **D.** No, because by 2051, the radioactive element remaining in the area is greater than 100 kilograms.

15. The formula $S = C(1 + r)^t$ models inflation, where C = the value today, r = the annual inflation rate (in decimal form), and S = the inflated value t years from now. If the inflation rate is 4%, how much will a house now worth $63,000 be worth in 25 years? Round your answer to the nearest dollar.

$S = 63000(1+.04)^{25} = 16947.688$

The house will be worth $ 16948 . (Round to the nearest dollar as needed.)

16. The function $f(x) = 90e^{-0.4x} + 10$ describes the percentage of information, f(x), that a particular person remembers x weeks after learning the information.

a. Substitute 0 for x and, without using a calculator, find the percentage of information remembered at the moment it is first learned.

b. Substitute 1 for x and find the percentage of information that is remembered after 1 week.

c. Find the percentage of information that is remembered after 12 weeks.

d. Find the percentage of information that is remembered after one year (52 weeks).

$f(0) = 90e^{-.4(0)} + 10$
$= 90 + 10 = 100.$

a. At the moment it is first learned, 100 % of the information is remembered.
(Round to one decimal place as needed.)

b. After one week, 70.3 % of the information is remembered. $f(x) = 90e^{-.4(1)} + 10 = 70.3288$
(Round to one decimal place as needed.)

c. After twelve weeks, 10.7 % of the information is remembered. $f(x) = 90e^{-.4(12)} + 10 = 10.7406$
(Round to one decimal place as needed.)

d. After one year, 10 % of the information is remembered. $f(x) = 90e^{-.4(52)} + 10 = 10.00000008$
(Round to one decimal place as needed.)

1. 41.900

2. 0.105

3. 0.492

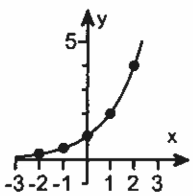
4. $\frac{1}{4}$

$\frac{1}{2}$

1

2

4

D. 

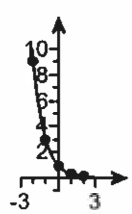
5. 9

3

1

$\frac{1}{3}$

$\frac{1}{9}$

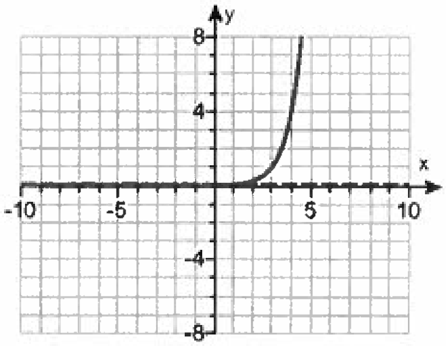
D. 

6. G. $y = 2^{-x}$

7. E. $f(x) = 4^x$

8. C. $f(x) = 2^x$

9.

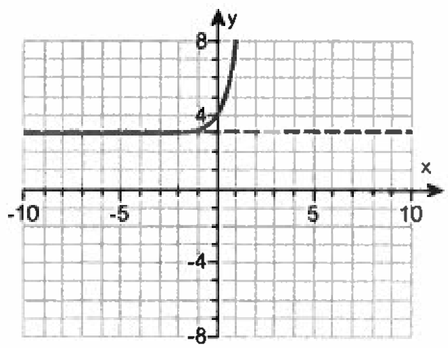


0

$(-\infty, \infty)$

$(0, \infty)$

10.

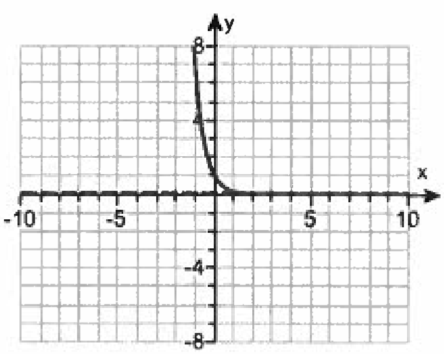


3

$(-\infty, \infty)$

$(3, \infty)$

11.



$y = 0$

$(-\infty, \infty)$

$(0, \infty)$

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12. 21,386.41

    21,442.54

    21,480.66

    21,499.94

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13. 563

    1126

    2251

    4502

    A. It appears that the population is growing by a factor of 2 every 27 years.

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14. 198.4

    D. No, because by 2051, the radioactive element remaining in the area is greater than 100 kilograms.

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15. 167,948

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16. 100.0

    70.3

    10.7

    10.0
