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Indicate the answer choice that best completes the statement or answers the question.

Evaluate each expression.

1. log 75 B
   a. 7.5 b. 1.88
   c. 0.53 d. 3.76

2. Solve $\log_6 x = 2$ A
   a. 36 b. 12
   c. 6 d. 64

3. Find ln 375. Round your answer to four decimal places.C
   a. –5.9269 b. 6.9269
   c. 5.9269 d. –6.9269

4. Find the amount of time required to double an amount at 5.84% if the interest is compounded continuously.C
   a. 5.15 years b. 5.94 years
   c. 11.87 years d. 23.74 years

Express each logarithm in terms of ln 3 and ln 5.

5. $\ln \frac{81}{125}$ C
   a. 4 ln 5 – 3 ln 3 b. 5 ln 3 – 3 ln 4
   c. 4 ln 3 – 3 ln 5 d. 3 ln 4 – 5 ln 3

Evaluate each expression.

6. $6^{\log_6 1.5}$ D
   a. 6 b. $6^{1.5}$
   c. 1.5^6 d. 1.5

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7. Evaluate the expression $\log_5 \frac{1}{25}$.B

a. $-\frac{1}{2}$ b. –2

c. $\frac{1}{2}$ d. 2

Evaluate each expression.

8. $\log_3 243$A

a. 5 b. 7

c. 4 d. 6

Use the graph of *f* to describe the transformation that results in the graph of *g*. Then sketch the graphs of *g* and *f*.

9. $f(x) = e^x$; $g(x) = -5e^{x+4} + 2$C

a. $g(x)$ is the graph of $f(x)$ translated 4 unit(s) to the left, 2 unit(s) down, and expanded vertically by a factor of 5.

b. $g(x)$ is the graph of $f(x)$ translated 4 unit(s) to the left, 2 unit(s) up, and expanded vertically by a factor of 5.

c. $g(x)$ is the graph of $f(x)$ translated 4 unit(s) to the right, 2 unit(s) up, and expanded vertically by a factor of 5.

d. $g(x)$ is the graph of $f(x)$ translated 4 unit(s) to the right, 2 unit(s) down, and expanded vertically by a factor of 5.

10. Jimmy invests $500 in an account with a 3% interest rate, making no other deposits or withdrawals. What will Jimmy's account balance be after 10 years if the interest is compounded 2 times each year?D

a. $173.43 b. $580.27

c. $903.06 d. $673.43

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11. Uranium ore is composed of two main isotopes, mostly U_{238} with just a trace amount of U_{235}. The two isotopes cannot be separated using chemical reactions because they are chemically identical. In a sample of Uranium ore 99.85% of the atoms are U_{238} atoms and 0.15% are U_{235} atoms. However, before the Uranium can be used in a nuclear power plant, the proportion of U_{235} must be increased to 15% (thus reducing the proportion of U_{238} to 85%).B

This is done by a process called gas diffusion. The ratio of the masses of these two isotopes is $\frac{238}{235} = 1.013$, which means gaseous U_{238} atoms will travel more slowly than the U_{235} atoms after the uranium ore is vaporized. Each cycle of the gas diffusion process will decrease the U_{238} proportion by 1.3%.

What will the U_{238} percent be after 6 cycles of the gas diffusion process? How many cycles will be needed to reduce the U_{238} percent to 85%?

a. 86.85%; 7 gas diffusion cycles
b. 92.31%; 13 gas diffusion cycles
c. 92.55%; 12 gas diffusion cycles
d. 92.05%; 11 gas diffusion cycles

Solve each equation.

12. $4^{x+7} = 5x^{-3}$ B

a. –65.13
b. 65.13
c. 14.53
d. 192.7

13. As automobiles age, the average miles traveled per gallon decreases. Determine the regression equation that best models the data.D

Age (years)	MPG
1	35
3	34
5	33
7	31
9	28
11	26
13	23
15	18

a. power
b. logarithmic
c. quadratic
d. exponential

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Use the graph of *f* to describe the transformation that results in the graph of *g*. Then sketch the graphs of *g* and *f*.

14. $f(x) = \left(\frac{1}{2}\right)^x$; $g(x) = \left(\frac{1}{2}\right)^{x+1} - 3$
B

a. $g(x)$ is the graph of $f(x)$ translated 3 unit(s) to the left and 1 unit(s) down.
b. $g(x)$ is the graph of $f(x)$ translated 1 unit(s) to the right and 3 unit(s) down.
c. $g(x)$ is the graph of $f(x)$ translated 3 unit(s) to the right and 1 unit(s) down.
d. $g(x)$ is the graph of $f(x)$ translated 1 unit(s) to the left and 3 unit(s) down.

15. Among various populations of plants or animals, diseases spread exponentially. Use the function $y = 8000(1 - e^{-0.03t})$ to model the spread of Common Corn Rust through a field of 8000 corn plants, with *t* equal to the number of days since the first case of the disease. How many plants will be infected with Common Corn Rust after 10 days?D

a. 761 b. 236
c. 5927 d. 2073

16. Use Newton's Law of Cooling, $y = ae^{-kt} + c$, to find the temperature of a substance as a function the time *t* in minutes that it has spent cooling off. Two samples of the substance were heated in a container of boiling water until their initial temperatures were both 100° C. The first sample will be cooled by being left out at a room temperature of 24° C, and the second sample of the substance will instead be cooled off in a refrigerator with an inside temperature of $c = 4°$ C. The value of *a* will equal the *difference* between each sample's initial temperature and that sample's surrounding temperature, and the cooling constant of the substance is $k = 0.12$.
C
Find the first sample's temperature after it has cooled for 20 minutes. Then find the second sample's temperature after it has cooled for 10 minutes.

a. 11.1° C; 30.1° C b. 33.1° C; 34.1° C
c. 30.9° C; 32.9° C d. 26.2° C; 5.2° C

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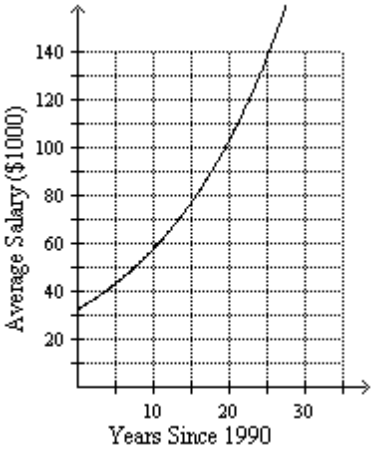
17. The nationwide average salary of a computer programmer can be modeled by the equation $y = 31.8 \times (1.06)^n$, where y is the salary in thousands of dollars and n is the number of years since 1990.A

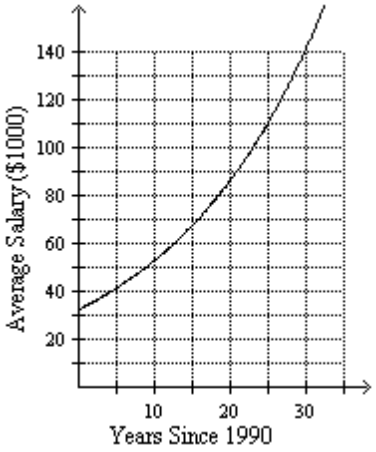
Graph the function. Then, using this model, predict the average programmer's salary in 2010.

a.



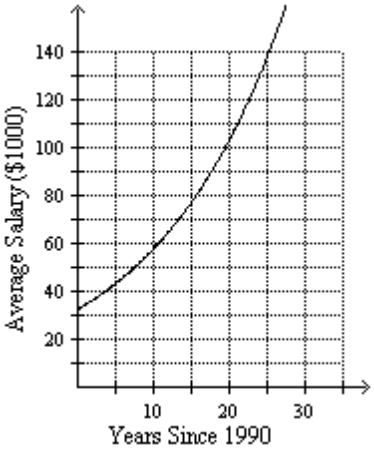
$102,000

b.



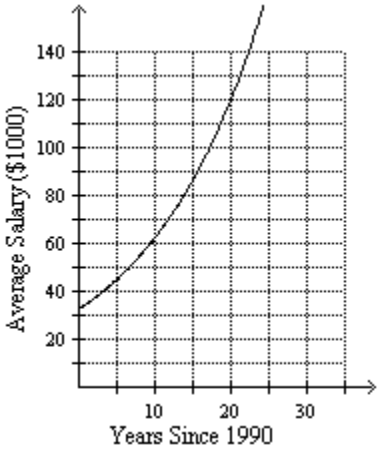
$83,000

c.



$86,000

d.



$121,000

Use the graph of *f* to describe the transformation that results in the graph of *g*.

18. $f(x) = \log x$; $g(x) = 2\log x + 6$A

a. The graph of $g(x)$ is the graph of $f(x)$ expanded vertically by a factor of 2, and translated 6 unit(s) up.
b. The graph of $g(x)$ is the graph of $f(x)$ reflected in the x-axis, expanded vertically by a factor of 2, and translated 6 unit(s) up.
c. The graph of $g(x)$ is the graph of $f(x)$ expanded vertically by a factor of 2, and translated 6 unit(s) down.
d. The graph of $g(x)$ is the graph of $f(x)$ reflected in the x-axis, expanded vertically by a factor of 2, and translated 6 unit(s) down.

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Use the graph of *f* to describe the transformation that results in the graph of *g*. Then sketch the graphs of *g* and *f*.

19. Find a logarithmic function to model the data.C

x	*y*
1	60
2	54
3	51
4	50
5	46
6	45
7	44

a. $f(x) = 60.73(0.95)^x$ b. $f(x) = 0.93(60.73)^x$

c. $f(x) = 60.04 - 8.25 \ln x$ d. $f(x) = 8.25 - 60.04 \ln x$

Use the graph of *f* to describe the transformation that results in the graph of *g*. Then sketch the graphs of *g* and *f*.

20. $f(x) = \left(\frac{1}{3}\right)^x$; $g(x) = \left(\frac{1}{3}\right)^{x-2} - 4$ C

a. $g(x)$ is the graph of $f(x)$ translated 4 unit(s) to the right and 2 unit(s) down.

b. $g(x)$ is the graph of $f(x)$ translated 2 unit(s) to the right and 4 unit(s) down.

c. $g(x)$ is the graph of $f(x)$ translated 2 unit(s) to the left and 4 unit(s) down.

d. $g(x)$ is the graph of $f(x)$ translated 4 unit(s) to the left and 2 unit(s) down.

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