Chapter 11 practice 1

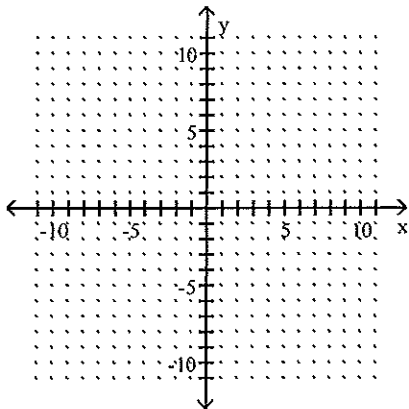**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**
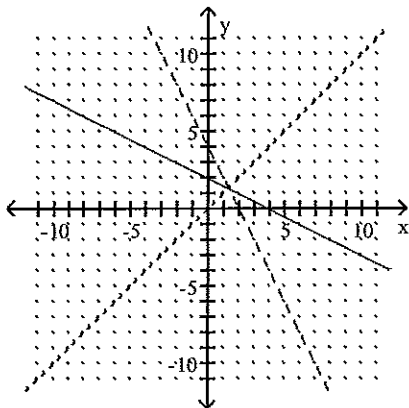
Sketch the graph of the given function, its inverse, and $y = x$ on the same set of axes. Graph the function with a solid line, and graph $y = x$ and the function's inverse using dotted lines.
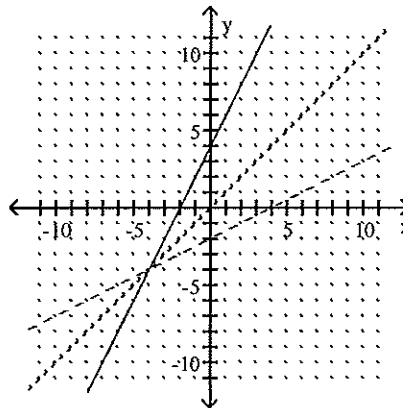
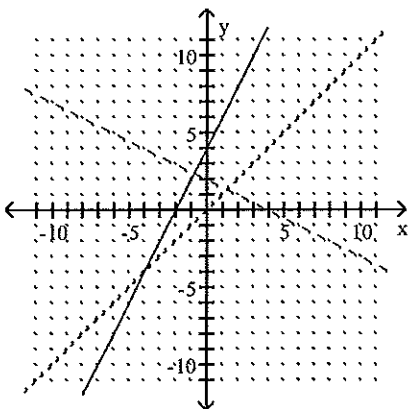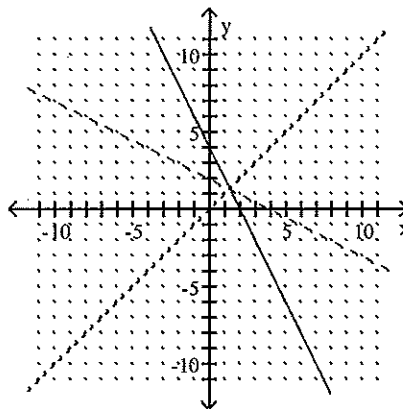1) $f(x) = 2x + 4$ 1) _____

A)

B)

C)

D)

1

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Solve the problem.

2) The average number of meals per person purchased at restaurants annually for various years are listed in the table below.

2) _____

Year	Average Number of Meals
1990	121.0
1992	123.5
1994	126.0
1996	132.0
1998	137.5
1999	139.0

(Source: The NPD Group, Eating Patterns in America)

Let $m = f(t)$ represent the average number of meals per person purchased at restaurants annually during the year that is t years since 1900. An equation for f is $f(t) = 2.12t - 71.01$.

i) Find an equation for f^{-1}.

ii) Find $f(125)$. What does your result mean in terms of the situation?

iii) Find $f^{-1}(125)$. What does your result mean in terms of the situation?

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the logarithm.

3) $\log_3(27)$

3) _____

    A) 3   B) 1   C) $\frac{1}{3}$ D) 9

4) $\log_3\left(\frac{1}{27}\right)$

4) _____

    A) 3   B) $\frac{1}{3}$ C) -3   D) 9

5) $\log_2(\log_2(16))$

5) _____

    A) 4   B) $\frac{1}{4}$ C) 2   D) $\frac{1}{2}$

Find the inverse of the given function.

6) 4^x

6) _____

    A) $\frac{1}{4^x}$ B) $\log_4(x)$ C) $-\log_4(x)$ D) $\sqrt[4]{x}$

Evaluate.

7) Let $g(x) = 4^x$. Find $g(2)$

7) _____

    A) 8   B) -16   C) 16   D) -8

8) Let $f(x) = \log_4(x)$. Find $f(64)$

A) $\dfrac{1}{3}$ B) 1   C) 12   D) 3

Write the equation in exponential form. Assume that all constants are positive and not equal to 1.

9) $\log_4 (64) = 3$

9) _____

A) $4^{64} = 3$ B) $64^3 = 4$ C) $4^3 = 64$ D) $3^4 = 64$

Solve.

10) $\log_2 (x + 3) = 1$

10) _____

A) 5   B) –2   C) 4   D) –1

11) $\log_5 (x^2) = 4$

11) _____

A) 25, –25   B) 625   C) 32   D) $2\sqrt{5}, -2\sqrt{5}$

Solve. Round any approximate solution to the fourth decimal place.

12) $2^{2x + 1} = 32$

12) _____

A) 16   B) 4   C) 2   D) –2

Solve the equation. Round the solution to four decimal places, if necessary.

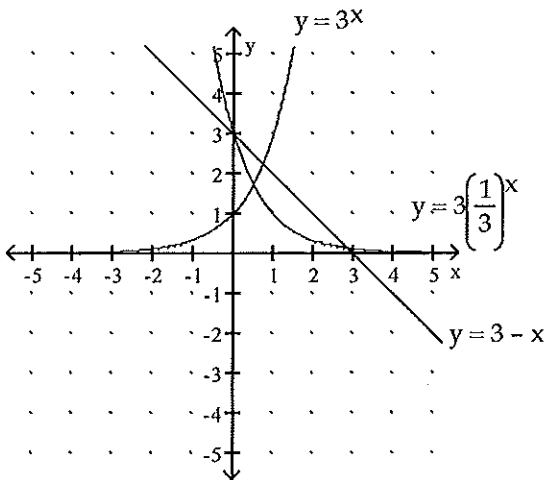13) $3^x + 1 = 55 - 4(3^x)$

13) _____

A) 0.7932   B) 2.3795   C) –2.1660   D) 2.1660

Estimate any solutions of the equation or system by referring to the graphs shown.

14) $3^x = 3\left(\dfrac{1}{3}\right)^x$

14) _____

A) 0   B) 2.9   C) 0.7   D) 0.5

Solve the problem.

15) The number of cases of a certain strain of influenza in the world are shown in the table for various years.   15) _____

Year	Number of Cases (thousands)
1993	283
1995	137
1998	63
2001	27
2004	19

Let f(t) be the number of cases (in thousands) in the year that is t years from 1990. Use a graphing calculator to find the equation of f, and predict how many cases there will be (to the nearest thousand) in 2007.

A) $f(t) = 508.64(0.78)^t$; 7 thousand

B) $f(t) = 241.97(0.79)^t$; 4 thousand

C) $f(t) = 510.64(0.77)^t$; 6 thousand

D) $f(t) = 240.97(0.78)^t$; 4 thousand

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

16) A storage tank contains radium, which has a half-life of 1600 years.   16) _____

i) Let f(t) represent the percent of the radium that remains in the tank at t years after the element was placed in the tank. Find an equation for f.

ii) Predict when 20% of the radium will remain.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Simplify. Write the expression as a single logarithm with a coefficient of 1.

17) $\log_7 (x - 4) - \log_7 (x - 7)$ 17) _____

A) $\log_7 \left(\dfrac{x-4}{x-7} \right)$

B) $\log_7 \left(\dfrac{x-4}{x+7} \right)$

C) $\log_7 (x^2 - 11x + 28)$

D) $\log_7 (3)$

18) $\log_8 2 + \log_8 (x^3 - 4) + \log_8 5$ 18) _____

A) $\log_8 (2x^3 - 8)$

B) $\log_8 (x^3 - 40)$

C) $\log_8 (x^3 + 3)$

D) $\log_8 (10x^3 - 40)$

Solve. If necessary, round the answer to two decimal places.

19) $\log_5 (10) - \log_5 (x) = 2$ 19) _____

A) 5   B) 1   C) $\dfrac{2}{5}$ D) $\dfrac{5}{2}$

20) $\log_3 (x + 5) - \log_3 (x - 1) = 2$ 20) _____

A) $-\dfrac{3}{4}$ B) $-\dfrac{7}{4}$ C) $\dfrac{7}{4}$ D) $\dfrac{3}{4}$

4

Find the natural logarithm.

21) $\ln\left(\dfrac{1}{e^7}\right)$

    A) 7   B) $\dfrac{1}{7}$ C) $-\dfrac{1}{7}$ D) -7

21) _____

Solve the equation.

22) $3 \ln (6x) = 6$

    A) $e^{1/3}$ B) e^2 C) $\dfrac{e^2}{6}$ D) $\dfrac{2}{\ln 6}$

22) _____

Solve the equation. Round the solution to four decimal places, if necessary.

23) $\ln (4x) + \ln (2x) = 8$

    A) 2   B) 19.3033   C) 154.4264   D) 1

23) _____

24) $e^{5x-3} \cdot e^{3x} = 107$

    A) 0.5876   B) 0.5115   C) 0.2091   D) 0.9591

24) _____

Simplify. Write the expression as a single logarithm with a coefficient of 1.

25) $8 \ln(x - 2) - 9 \ln(x)$

    A) $\ln(72x(x - 2))$ B) $\ln(x^9(x - 2)^8)$ C) $\ln\left(\dfrac{8(x - 2)}{9x}\right)$ D) $\ln\left(\dfrac{(x - 2)^8}{x^9}\right)$

25) _____

26) $2 \ln (x^2) + 2 \ln (6x)$

    A) $\ln (36x^6)$ B) $\ln (6x^6)$ C) $\ln (x^4 + 6x^2)$ D) $\ln (x^4 + 36x^2)$

26) _____

Solve the problem.

27) Since the late 1990's electronic payments made to an online company have increased exponentially.

Year	Number of Electronic Payments (thousands)
1999	53
2001	97
2003	185
2005	354
2006	487

Let $f(t)$ be the number of electronic payments in the year that is t years since 1995. A possible equation of f is $f(t) = 14.38e^{0.32x}$. Predict the number of electronic payments that will be made in 2010.

    A) 643 thousand   B) 32 thousand   C) 1747 thousand   D) 4750 thousand

27) _____

28) The function $y = 900e^{-0.0099x}$ models the amount in pounds of a particular radioactive material stored in a concrete vault, where x is the number of years since the material was put into the vault. If 900 pounds of the material are placed in the vault, how much time will need to pass for only 369 pounds to remain?

    A) 180 years   B) 90 years   C) 100 years   D) 95 years

28) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

A graph of a function of the form $y = ab^x$ is given. What can you conclude about the constants a and b?

20)
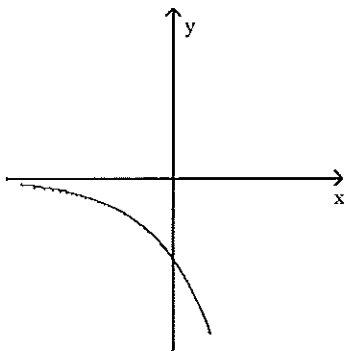
A) $a < 0,\ b > 1$ 　　　 B) $a < 0,\ 0 < b < 1$ 　　 C) $a > 0,\ b > 1$ 　　 D) $a > 0,\ 0 < b < 1$

1) B
2) i) $f^{-1}(m) = 0.47m + 33.50$
   ii) 193.99; The average number of meals per person purchased at restaurants annually will be about 194 in 2025.
   iii) 92.25; The average number of meals per person purchased at restaurants annually was 125 in 1992.
3) A
4) C
5) C
6) B
7) C
8) D
9) C
10) D
11) A
12) C
13) D
14) D
15) A
16) i) $f(t) = 100(\frac{1}{2})^{t/1600}$ or $f(t) = 100(0.999567)^t$
    ii) 3716 years
17) A
18) D
19) C
20) C