## Math 230 Review

Solve. **1.** |2x-11| = 5 **2.** |3(2-x)+7x| = 14 **3.** 2|5x-3|+7=21**4.** |2x+1| = |x-19|

Solve the inequality. Graph your solution on a number line and write your solution in interval notation.

**5.** |2x-9| < 7 **6.** |4x-6| < 10 **7.**  $|3x-1| + 5 \le 9$  **8.** 3|x-9| - 5 < 4

Solve the inequality. Graph your solution on a number line and write your solution in interval notation.

**9.** 
$$|x-4| > 1$$
 **10.**  $|8x-5| + 7 \ge 10$  **11.**  $|2x-9| - 5 \ge 5$  **12.**  $|6x-11| - 5 \ge 8$ 

Simplify.

**13.**  $\sqrt{r^{19}s^{18}t^{28}}$  **14.**  $\sqrt[3]{x^{30}y^{21}z^{25}}$  **15.**  $\sqrt[5]{x^{80}y^{40}z^{11}}$  **16.**  $\sqrt{180x^{25}y^{21}}$ 

Simplify.  
**17.** 
$$8\sqrt{11} - 19\sqrt{11}$$
  
**19.**  $\sqrt[4]{2} + 6\sqrt[4]{32} + 9\sqrt[4]{512}$ 

**18.** 
$$2\sqrt{48} + 5\sqrt{3}$$
  
**20.**  $13\sqrt{128} + 6\sqrt{169} - 7\sqrt{121} - 11\sqrt{162}$ 

Multiply.  
**21.** 
$$(9\sqrt{2} - 4\sqrt{3})(\sqrt{2} + 3\sqrt{3})$$
  
**23.**  $(4\sqrt{3} + 15)(4\sqrt{3} - 15)$ 

**22.** 
$$(5\sqrt{3} + 4\sqrt{2})(7\sqrt{3} - 6\sqrt{2})$$
  
**24.**  $(8\sqrt{7} + 5\sqrt{5})^2$ 

Rationalize the denominator and simplify.

**25.** 
$$\frac{2x^8}{\sqrt{10xy^3}}$$
 **26.**  $\frac{8\sqrt{2}}{4-\sqrt{6}}$  **27.**  $\frac{\sqrt{5}+\sqrt{2}}{\sqrt{10}-\sqrt{2}}$  **28.**  $\frac{\sqrt{12}-9\sqrt{10}}{6\sqrt{3}-4\sqrt{5}}$ 

Solve.

**29.** 
$$\sqrt{3x+10} = x$$
  
**30.**  $x = \sqrt{54+5x-x^2} - 3$   
**31.**  $\sqrt[3]{6x+7} = \sqrt[3]{x-5}$   
**32.**  $\sqrt{x+14} - \sqrt{x-10} = 2$ 

Multiply.

**33.** 
$$(7+6i)(7-6i)$$
 **34.**  $(5-2i)(8-10i)$ 

**4.** 
$$(5-2i)(8-10i)$$
 **35.**  $(10+3i)^2$ 

**36.** (5i+4)(4i-5)

Solve.

**37.**  $(x+14)^2 = -144$  **38.**  $(x+3)^2 - 11 = 38$  **39.**  $3(x+1)^2 + 11 = 83$ **40.**  $(2x+8)^2 - 5 = 11$ 

Solve.	
<b>41.</b> $x^2 + 4x - 45 = 0$	<b>42.</b> $x^2 + 8x + 10 = 0$
<b>43.</b> $x^2 + 5x + 12 = 0$	<b>44.</b> $x^2 + 8x = 12$
Solve.	
$45. \ x^4 + 12x^2 + 32 = 0$	<b>46.</b> $x^4 + x^2 - 2 = 0$
<b>47.</b> $x + 13\sqrt{x} - 30 = 0$	<b>48.</b> $1 + \frac{5}{x} - \frac{24}{x^2} = 0$

Solve the quadratic inequality. Express your solution using interval notation.

<b>49.</b> $x^2 + 2x - 63 < 0$	<b>50.</b> $x^2 + 8x + 15 > 0$
<b>51.</b> $x^2 + 6x \le 27$	<b>52.</b> $x^2 - 4x \ge 45$

Solve the quadratic inequality. Express your solution using interval notation.

**53.** 
$$\frac{x+8}{x-6} > 0$$
  
**54.**  $\frac{(x+2)(x-2)}{x+1} \le 0$   
**55.**  $\frac{x^2+7x-8}{x^2-49} \ge 0$   
**56.**  $\frac{x^2+15x+44}{x^2-7x-60} \ge 0$ 

**57.** The length of a rectangular room is 3 feet more than twice its width. If the area of the room is 160 square feet, find the dimensions of the room. Round to the nearest tenth of a foot.

**58.** Steve has a rectangular lawn, and the width of the lawn is 25 feet more than the length of the lawn. If the area of the lawn is 7000 square feet, find the dimensions of the lawn. Round to the nearest tenth of a foot.

**59.** Victor flew to a city that was 700 miles north and 2400 miles east of his starting point. How far did he fly to reach this city?

**60.** George is casting a shadow on the ground. If George is 2 feet shorter than the length of the shadow on the ground, and the tip of the shadow is 10 feet from the top of George's head, how tall is George?

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Evaluate the given function.

**61.** 
$$f(x) = 8x - 43$$
,  $f(-9)$   
**62.**  $f(x) = \frac{3}{4}x - 9$ ,  $f(16)$   
**63.**  $f(x) = \frac{5}{8}x + \frac{13}{6}$ ,  $f(\frac{5}{3})$   
**64.**  $f(x) = 2x + 21$ ,  $f(2a + 10)$ 

Graph. Label the vertex, the *y*-intercept and any *x*-intercepts.

**65.**  $y = x^2 - 7x + 5$ **66.**  $y = x^2 + 6x + 10$ **67.**  $y = -x^2 + 6x - 6$ **68.**  $y = -x^2 + 4x - 4$ 

Graph. Label the vertex, the *y*-intercept and any *x*-intercepts.

**69.**  $y = (x-2)^2 + 3$  **70.**  $y = (x-5)^2 + 1$  **71.**  $y = -(x+1)^2 + 3$ **72.**  $y = -(x+3)^2 + 8$ 

Graph. State the domain and range of the function.

**73.** 
$$f(x) = |x+6|$$
**74.**  $f(x) = |x|+1$ 
**75.**  $f(x) = |x+3|-4$ 
**76.**  $f(x) = -|x+6|$ 

Graph. State the domain and range of the function.

77.  $f(x) = \sqrt{x+1} - 7$ 78.  $f(x) = \sqrt{x-5} - 2$ 79.  $f(x) = \sqrt{x-9} - 10$ 80.  $f(x) = -\sqrt{x+4}$ 

Graph. State the domain and range of the function.

81. 
$$f(x) = x^3 + 8$$
  
82.  $f(x) = (x+1)^3$   
83.  $f(x) = (x-2)^3 - 4$   
84.  $f(x) = -(x+2)^3 - 5$ 

**85.** A pilot flying at a height of 5000 feet determines that she must eject from her plane. The ejection seat launches with an initial velocity of 144 feet/second. The height of the pilot (in feet) *t* seconds after ejection is given by the function  $h(t) = -16t^2 + 144t + 5000$ . What is the maximum height that the pilot reaches?

**86.** At the start of a college football game, a referee tosses a coin to determine which team will receive the opening kickoff. The height of the coin (in meters) after *t* seconds is given by the function  $h(t) = -4.9t^2 + 2.1t + 1.5$ . What is the maximum height that the coin reaches?

87. If an astronaut on the moon throws a rock upward with an initial velocity of 78 feet per second, the height of the rock (in feet) after *t* seconds is given by the function  $h(t) = -2.6t^2 + 78t + 5$ . What is the maximum height that the rock reaches?

**88.** What is the maximum product of two numbers whose sum is 24?

**89.** For 
$$f(x) = 4x + 11$$
 and  $g(x) = 3x - 17$ , find  
(a)  $(f + g)(x)$  (b)  $(f + g)(8)$  (c)  $(f + g)(-3)$   
**90.** For  $f(x) = x^2 - 3x - 54$  and  $g(x) = x^2 + 9x + 14$ , find  
(a)  $(f \cdot g)(x)$  (b)  $(f \cdot g)(4)$  (c)  $(f \cdot g)(-10)$   
**91.** Let  $f(x) = 5x - 9$  and  $g(x) = 2x - 17$ . Find  $(f - g)(x)$ .  
**92.** Let  $f(x) = 5x - 9$  and  $g(x) = 2x - 17$ . Find  $(f \cdot g)(x)$ .  
For the function  $f(x)$  simplify the difference quotient  $\frac{f(x+h) - f(x)}{h}$ .  
**93.**  $f(x) = x^2 - 10x$   
**94.**  $f(x) = x^2 - 9x + 17$   
**95.**  $f(x) = x^2 + 8x + 45$   
**96.**  $f(x) = 3x^2 - 11x + 49$   
**97.** Let  $f(x) = 4x + 7$  and  $g(x) = x - 3$ . Find  $(g \circ f)(-1)$ .  
**98.** Let  $f(x) = 2x - 9$  and  $g(x) = x^2 - 9x + 18$ . Find  $(g \circ f)(10)$ .  
**99.** For  $f(x) = 3x + 5$  and  $g(x) = 2x + 4$ , find  
(a)  $(f \circ g)(x)$  (b)  $(g \circ f)(x)$  (c)  $(f \circ g)(3)$  (d)  $(g \circ f)(-4)$   
**100.** For  $f(x) = x^2 - 7x - 18$  and  $g(x) = x - 9$ , find  
(a)  $(f \circ g)(x)$  (b)  $(g \circ f)(x)$  (c)  $(f \circ g)(3)$  (d)  $(g \circ f)(-4)$   
Solve.  
**101.**  $4^{-2x+11} = 64$   
**102.**  $2^{x+10} = 4295$   
**103.**  $e^{x-6} = 290$   
**104.**  $e^{2x-3} = 37$ 

Solve. Round to the nearest mousandth.	
<b>105.</b> $\log_2(x+8) - 7 = -2$	<b>106.</b> $\log_8(x-3) + \log_8(x+9) = 2$
<b>107.</b> $\log(x+15) + \log x = 3$	<b>108.</b> $\log_6(7x+11) - \log_6(2x-9) = 1$

For the given function f(x), find its inverse function  $f^{-1}(x)$ . **109.**  $f(x) = e^{x+6} + 9$  **110.**  $f(x) = \ln(x+10) - 18$  **111.**  $f(x) = e^{x-5} + 4$ **112.**  $f(x) = \ln(x-6)$ 

For the given function f(x), find its inverse function  $f^{-1}(x)$ .

**113.** 
$$f(x) = 7x - 6$$
  
**114.**  $f(x) = \frac{2}{3}x - 10$   
**115.**  $f(x) = \frac{1}{x - 5}$   
**116.**  $f(x) = \frac{8 + 4x}{3x}$ 

**117.** In 1974 a first-class U.S. postage stamp cost 10 cents. By 1994, the cost of a stamp had risen to 32 cents. If the cost of a first-class U.S. postage stamp continues to rise exponentially, how much would it cost to buy a stamp in 2020?

**118.** An investor has deposited \$80,000 in an account that pays 5.3% annual interest, compounded continually. How long will it take until the account's balance is \$100,000?

**119.** In 1997, the average value per acre of U.S. farm cropland was \$1270. The average value had increased to \$1650 by 2002. If the average value continues to grow exponentially at the same rate, when will the average value be \$3000 per acre?

**120.** During its exponential growth phase, a colony of the bacteria *E. coli* grew from 15,000 cells to 60,000 cells in 40 minutes. How long would it take the colony to grow to 250,000 cells?

**121.** Mark needs \$5000 to take a family vacation to Florida. If he deposits \$2000 in an account that pays 9% annual interest, compounded monthly, how long will it take until there is enough money in the account to pay for the vacation?

**122.** In the year 2000, Home Depot had 1134 stores nationwide. By 2002, this total had grown to 1532. If the number of stores continues to grow exponentially at the same rate, how many stores will there be in the year 2012? (*The Home Depot, Inc.*)

**123.** During its exponential growth phase, a colony of the bacteria *Bacillus megaterium* grew from 20,000 cells to 40,000 cells in 25 minutes. How many cells will be present after 60 minutes?

**124.** The half-life of bismuth-210 is 5 days. If 10 grams of bismuth-210 are present initially, how much will remain after 2 weeks?

Graph. Label any intercepts and asymptotes. State the domain and range of the function. **125.**  $f(x) = 3^{x-1} - 15$  **126.**  $f(x) = e^{x+4} + 6$  **127.**  $f(x) = \log(x-2) - 1$ **128.**  $f(x) = \log_3(x-1) + 1$ 

Graph. Label the vertex and any intercepts. **129.**  $x = (y-1)^2 - 7$ 

**130.**  $x = -y^2 + 2y + 15$ 

Graph. Find the center and the radius. **131.**  $(x + 4)^2 + (y - 6)^2 = 25$ 

**132.** 
$$x^2 + y^2 + 18x - 6y - 10 = 0$$

Graph. Find the center, *a*, and *b*.

**133.** 
$$\frac{(x-1)^2}{9} + \frac{(y+5)^2}{16} = 1$$
   
**134.**  $9x^2 + 25y^2 + 54x - 100y - 44 = 0$ 

Graph. Find the center, *a*, and *b*. Sketch the asymptotes.

**135.** 
$$\frac{y^2}{16} - \frac{x^2}{36} = 1$$
 **136.**  $\frac{(x+3)^2}{4} - \frac{(y-3)^2}{25} = 1$