College Algebra Spring 2013
Chapters 5 and 7 Practice Test

I. Find the inverse of the function.

1. $f(x) = \frac{x}{7} - 3$
2. $f(x) = 7x^3 - 6$

II. Find the requested composition of functions.

3. Given $f(x) = 4x^2 + 2x + 5$ *and* $g(x) = 2x - 3$,
   a) Find $(g \circ f)(x)$
   b) Find $(f \circ g)(x)$

III. For the pair of functions, perform the indicated operations. Also evaluate each function at $x = -2$.

4. $f(x) = 5x^2 - 8x$ *and* $g(x) = x^2 - 3x - 40$
   a) Find $(g + f)(x)$
   b) Find $(g - f)(x)$
   c) Find $(f - g)(x)$
   d) Find $(fg)(x)$
   e) Find $\left(\frac{f}{g}\right)(x)$ and its domain.
   f) Find $\left(\frac{g}{f}\right)(x)$ and its domain.

IV. Use the equation of the polynomial function to

a) State the degree
b) State the leading coefficient
c) Find the y-intercept(s) of $f(x)$.
d) Describe the end behavior of the graph of the function

5. $f(x) = -20x^3 + 6x - 7$
6. $f(x) = 12x^4 - 3x^3 + 9$
7. $f(x) = -8(x + 2)(x^5 - 2)$

V. Use the graph of the function to find the local maximum and local minimum, round to the nearest hundredth.

8. $y = x^3 - x^2 - 3x + 2$
9. $y = 3x^3 - 4x^2 - 6x + 2$

VI. Solve the polynomial equation.

10. $(2x - 7)(x + 5)(x - 5) = 0$
11. $x^3 - 5x^2 + 6x = 0$
12. $4x^3 - 24x^2 - x + 6 = 0$
13. $x^4 - 6x^2 + 8 = 0$
14. $\frac{1}{7}x^3 + 49 = 0$

VII. Find a) the domain b) any removable discontinuities (holes) c) horizontal asymptotes d) vertical asymptotes e) sketch a graph of the function.

15. $f(x) = \frac{x^2+x-9}{x^2-9}$
16. $f(x) = \frac{x^2-4}{x-2}$
17. $f(x) = \frac{x-3}{x+4}$

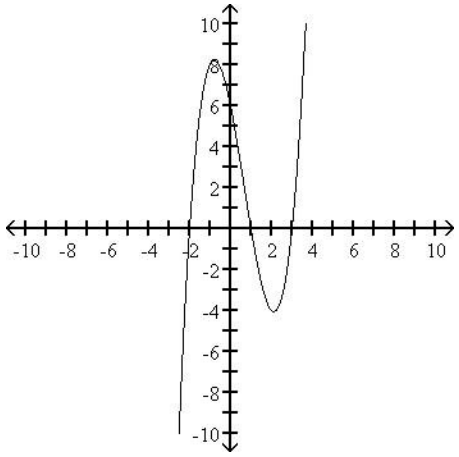
VIII. Use the given graph of the polynomial function to

a) Estimate the x-intercept(s)

b) State whether the leading coefficient is positive or negative

c) Determine whether the polynomial function is cubic or quartic

18.



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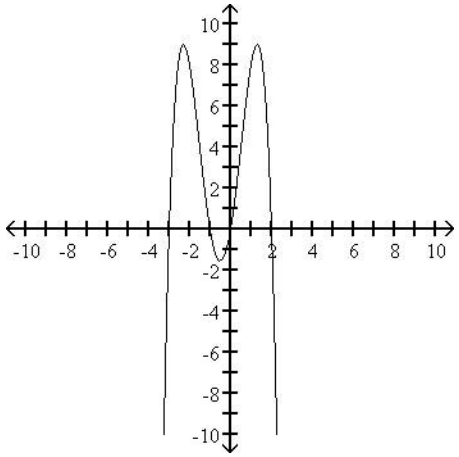
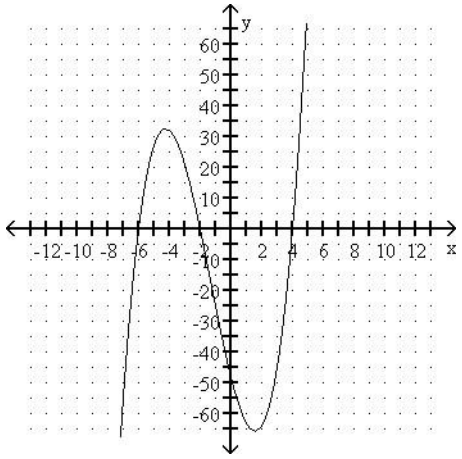


IX. Given the graphs below, answer the following. Assume that the leading coefficient is $1\ or\ -1$.

a) State the number of turning points.
b) State the zeros.
c) State whether the leading coefficient is $1\ or\ -1$.
d) Write the equation in factored form.

20.



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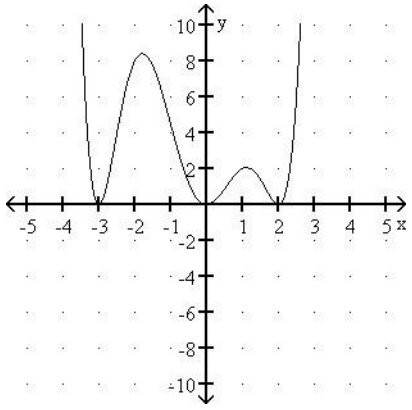

X. Solve the problem.

22. The supply function for a product is $p(x) = \frac{1}{3}x^2 + 30, x \geq 0$, where x is the number of thousands of units a manufacturer will supply if the price is p(x) dollars.

a) Find the inverse of this function.

b) For this problem, what does the inverse compute?

c) **Using the inverse function**, how many units are supplied if the price is $462?

23. A rectangular piece of cardboard measuring 17 inches by 43 inches is to be made into a box with an open top by cutting equal size squares from each corner and folding up the sides. Let x represent the length of a side of each such square. For what value of x will the volume be a maximum? If necessary, round to 2 decimal places.

24. Suppose a cost-benefit model is given by $y = \frac{3.4x}{100-x}$, where y is the cost in thousands of dollars for removing x percent of a given pollutant. Find the cost of removing 75% to the nearest dollar.

25. You are interested in a 40-inch TV at Best Buy. The TV is being sold with a rebate of $75 and a 25% discount. Which is the better deal: take the rebate first followed by the discount, or take the discount first followed by the rebate?
    a) Write the function, $R(x)$, for the price of the TV with the rebate.
    b) Write the function, $D(x)$, for the price of the TV with the discount.
    c) Find $(R \circ D)(x)$.
    d) Find and interpret $(R \circ D)(825)$.
    e) Find $(D \circ R)(x)$.
    f) Find and interpret $(D \circ R)(825)$.
    g) Which is the least expensive option for purchasing the TV?

Answers:

1. $f^{-1}(x) = 7x + 21$
2. $f^{-1}(x) = \sqrt[3]{\frac{x+6}{7}}$
3. a) $(g \circ f)(x) = 8x^2 + 4x + 7$ b) $(f \circ g)(x) = 16x^2 - 44x + 35$
4. a) $(g + f)(x) = 6x^2 - 11x - 40$ $(g + f)(-2) = 6$
   b) $(g - f)(x) = -4x^2 + 5x - 40$ $(g - f)(-2) = -66$
   c) $(f - g)(x) = 4x^2 - 5x + 40$ $(f - g)(-2) = 66$
   d) $(fg)(x) = 5x^4 - 23x^3 - 176x^2 + 320x$ $(fg)(-2) = -1080$
   e) $\left(\frac{f}{g}\right)(x) = \frac{5x^2-8x}{x^2-3x-40}, domain: x \in \mathbb{R}, x \neq -5, 8$ $\left(\frac{f}{g}\right)(-2) = -1.2$
   f) $\left(\frac{g}{f}\right)(x) = \frac{x^2-3x-40}{5x^2-8x}, domain: x \in \mathbb{R}, x \neq 0, \frac{8}{5}$ $\left(\frac{g}{f}\right)(-2) = -0.833$
5. a) 3 b) -20 c) $f(0) = -7$ d) Left end rises and right end falls
6. a) 4 b) 12 c) $f(0) = 9$ d) Both ends rise
7. a) 6 b) -8 c) $f(0) = 32$ d) Both ends fall
8. $Local\ Max = (-0.72, 3.27), Local\ Min = (1.39, -1.42)$
9. $Local\ Max = (-0.49, 3.63), Local\ Min = (1.37, -6.01)$
10. $x = \frac{7}{2}, -5, 5$
11. $x = 0, 2, 3$
12. $x = \frac{1}{2}, \frac{-1}{2}, 6$
13. $x = \pm 2, \pm\sqrt{2}$
14. $x = -7$
15. a) $(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$ b) None c) $y = 1$ d) $x = \pm 3$
    e) use calculator to check graph
16. a) $(-\infty, 2) \cup (2, \infty)$ b) hole at $(2, 4)$ c) none d) none
    e) use calculator to check graph, hole at $x = 2$
17. a) $(-\infty, -4) \cup (-4, \infty)$ b) None c) $y = 1$ d) $x = -4$
    e) use calculator to check graph
18. a) $(-2, 0), (1, 0), (3, 0)$ b) positive c) cubic

19. a) $(-3,0), (-1,0), (0,0), (2,0)$ b) negative c) quartic
20. a) 2 b) $x = -6, -2, 4$ c) 1 d) $(x+6)(x+2)(x-4)$
21. a) 5 b) $x = -3, 0, 2$ c) 1 d) $(x+3)^2(x)^2(x-2)^2$
22. a) $f^{-1}(x) = \sqrt{3x-90}$ b) Given the price in dollars, f^{-1} computes the number of units (in thousands) c) For the price of \$462, we will have 36 thousand units.
23. 3.75 in
24. \$10,200
25. a) $R(x) = x - 75$ b) $D(x) = 0.75x$ c) $(R \circ D)(x) = 0.75x - 75$
    d) $(R \circ D)(825) = \$543.75$ e) $(D \circ R)(x) = 0.75x - 56.25$
    f) $(D \circ R)(825) = \$562.50$ g) $(R \circ D)(x)$ The cost of the TV with the discount taken before the rebate is the least expensive option.