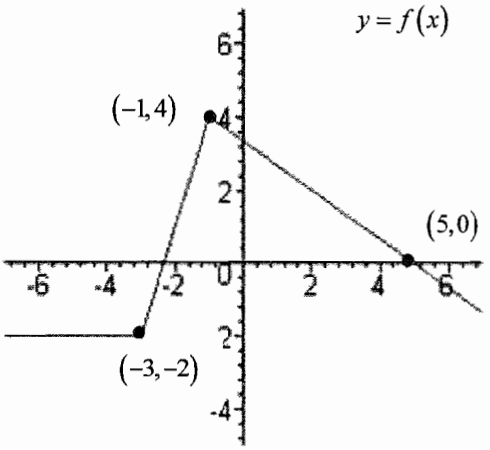
The following 15 multiple choice questions are worth 5 points each.

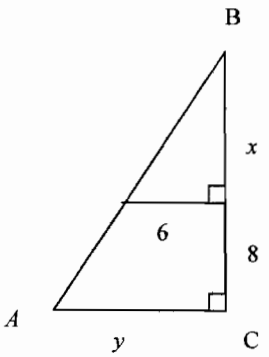
1. The graph of $y=-f(x-3)$ is obtained from the graph of $y=f(x)$ shown below. Under this transformation the point $(-1,4)$ will be translated to what point?

   a. $(4,4)$
   b. $(-1,-1)$
   c. $(2,-4)$
   d. $(-4,-4)$
   e. $(-2,4)$



2. Express the area of ΔABC as a function of x.

   a. $A=\dfrac{20(x+8)}{x}$
   b. $A=\dfrac{(3x+4)(x+8)}{2}$
   c. $A=\dfrac{y}{2}(x+8)$
   d. $A=\dfrac{(x+8)^2}{2}$
   e. $A=\dfrac{3(x+8)^2}{x}$



3. A football stadium manager has determined that with a ticket price of \$20 that an average of 20,000 people will attend the games. For each \$1 increase in price, 500 fewer tickets will be sold. Let n represent the number of times the ticket price is increased by \$1.
Express the revenue taken in from the sale of tickets as a function of n.

   a. $R(n)=(20-n)(20,000+500n)$
   b. $R(n)=(20+n)(500n-20,000)$
   c. $R(n)=(20-n)(20,000+500n)$
   d. $R(n)=(20+n)(20,000-500n)$
   e. $R(n)=20n(20,000-500n)$

4. Determine the domain and range of the piecewise function: $f(x)=\begin{cases}2 & \text{if } x<-2\\ -x & \text{if } -2\le x\le 2\\ -2 & \text{if } x>2\end{cases}$

   a. Domain: $(-\infty,\infty)$; Range: $[-2,2]$
   b. Domain: $(-\infty,\infty)$; Range: $\{-2\}\cup[0,2]$
   c. Domain: $(-\infty,\infty)$; Range: $(-1.9,1.9)$
   d. Domain: $[-2,2]$; Range: $(-\infty,\infty)$
   e. Domain: $(-\infty,-2)\cup(-2,2)\cup(2,\infty)$;
      Range: $[-2,2]$

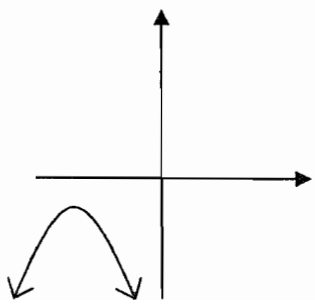
5. Which of the following statements is/are true about the graph of $f(x)=x^2-10x-11$?

   I. There is no maximum value.
   II. The equation of the axis of symmetry is $x=5$.
   III. The solution of $f(x)\le 0$ is $[-1,\infty)$.

   a. All are true
   b. I only is true
   c. II and III only are true
   d. I and III only are true
   e. I and II only are true

6. The graph of a quadratic function $f(x)=ax^2+bx+c$ is shown to the right. Which of the following must be true?

   a. $a<0,\ b^2-4ac<0$
   b. $a>0,\ b^2-4ac<0$
   c. $a<0,\ b^2-4ac=0$
   d. $a>0,\ b^2-4ac>0$
   e. $a<0,\ b^2-4ac>0$



7. Let $h(x)=\left(\frac{2x+7}{x-9}\right)^3$. Find two functions f and g such that $h(x)=(f\circ g)(x)$.

a. $f(x)=\frac{1}{x^3}$; $g(x)=\frac{2x+7}{x-9}$

b. $f(x)=x^3$; $g(x)=\frac{2x+7}{x-9}$

c. $f(x)=\frac{2x+7}{x-9}$; $g(x)=x^3$

d. $f(x)=\left(\frac{x+7}{x-9}\right)^3$; $g(x)=2x$

e. $f(x)=\frac{2x^3+7}{x^3-9}$; $g(x)=x$

8. Given $f(x)=\frac{1}{x+6}$ and $g(x)=\frac{1}{x}+6$, find $(g\circ f)(x)$.

a. $(g\circ f)(x)=\frac{x+6}{6x}$

b. $(g\circ f)(x)=x+12$

c. $(g\circ f)(x)=\frac{x}{1+12x}$

d. $(g\circ f)(x)=\frac{x}{12}$

e. $(g\circ f)(x)=x+6$

9. For the function $(g\circ f)(x)$ which you found in problem #8 above, determine the domain.

a. $D_{g\circ f}:(-\infty,\infty)$

b. $D_{g\circ f}: x\neq -\frac{1}{12}$

c. $D_{g\circ f}: x\neq -12$

d. $D_{g\circ f}: x\neq 0$

e. $D_{g\circ f}: x\neq -6$

10. Let $f(x)=\frac{5x+3}{1-2x}$. Find $f^{-1}(x)$.

a. $f^{-1}(x)=\frac{x+3}{5+2x}$

b. $f^{-1}(x)=\frac{x-3}{5+2x}$

c. $f^{-1}(x)=\frac{x-3}{3}$

d. $f^{-1}(x)=\frac{x+3}{5}$

e. $f^{-1}(x)=\frac{x-3}{2x-5}$

11. Which of the following is/are true regarding polynomial functions?

I. The number of x-intercepts equals, at most, the degree of the polynomial.
II. If the graph of a polynomial function has 4 turning points, the degree of the polynomial must be 5 or higher.
III. For every graph of a polynomial of degree two or higher, there must be at least one turning point.

a. All are true
b. Only III is true
c. Only I and II are true
d. Only II and III are true
e. Only I and III are true

12. What is the remainder when $p(x)=x^6-x-3$ is divided by $x+1$?

a. -3
b. 1
c. -1
d. 3
e. 0

13. Let $f(x)=x^3+2$. Find and simplify the difference quotient: $\dfrac{f(x+h)-f(x)}{h}$

a. h^2

b. $\dfrac{h^2+4}{h}$

c. $\dfrac{3x^2h+3xh^2+h^3+4}{h}$

d. $3x^2+3xh+h^2$

e. h^2+4

14. Write a polynomial function, $p(x)$, whose only real zeros are -1, 2 and 3 with multiplicities 3, 2 and 1 respectively and for which $p(1)=-32$.

a. $p(x)=2(x+1)^3(x-2)^2(x-3)$

b. $p(x)=(x-1)^3(x+2)^2(x+3)$

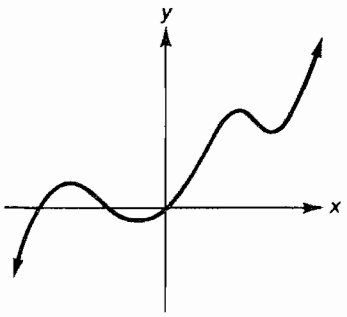
c. $p(x)=-2(x-1)^3(x+2)^2(x+3)$

d. $p(x)=-2(x+1)^3(x-2)^2(x-3)$

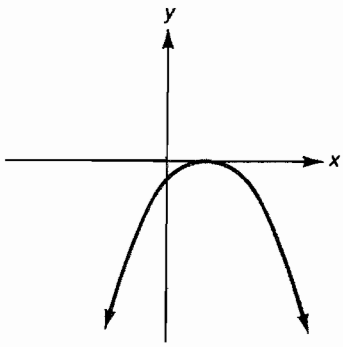
e. $p(x)=2(x-1)^3(x+2)^2(x+3)$

15. Which of the following graphs could be a complete graph of a fourth degree polynomial with a negative leading coefficient?

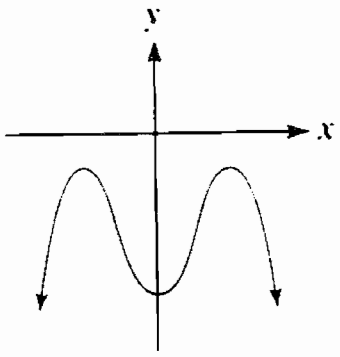
I.



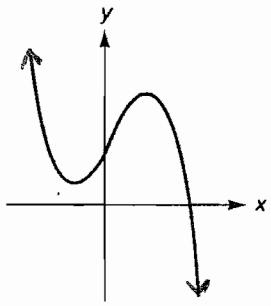
II.



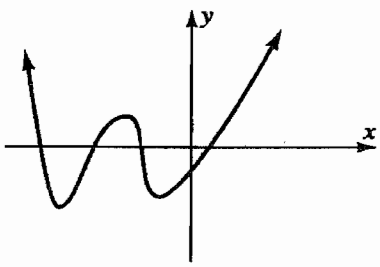
III.



IV.



V.



a. I and IV
b. I, IV and V
c. II and V
d. I, II and IV
e. II and III

Name_____ Instructor_____ Section_____

Questions 16 and 17 are free response. Page 7 and the graph paper should be turned in with your Answer Sheet. To receive credit please show all (correct) work.

16. (12 pts) Let $f(x)=\sqrt{x+2}$

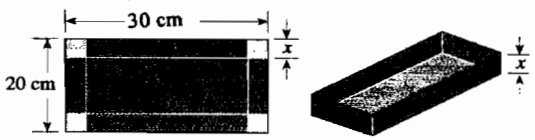
a. Determine the equaiton for $f^{-1}(x)$. To receive credit show proper work or explanation.

b. Use interval notation to give the domain and range of f and f^{-1}.

	f	f^{-1}
Domain	_____	_____
Range	_____	_____

c. On the graph paper sketch the graphs of f and f^{-1}.

17. (13 pts) An open box is to be constructed from a piece of cardboard, that is 20 cm by 30 cm, by cutting squares of side length x from each corner and folding up the sides, as shown in the figure.



a. Express the volume V of the box as a function of x.

b. On the graph paper sketch a graph of the function $V(x)$. Make sure to label all intercepts and indicate all turning points.

c. Find the dimensions of the box that maximizes the volume of the box.