Honors Precalculus 2008 Summer Assignment

Work each problem out on your own paper, and then select the best answer among the choices. There must be supporting analysis or explanation for every problem. No work means no credit, even if the answer selected is correct!

1. Simplify $\frac{3\sqrt{56}}{\sqrt{21}}$.

   a. $2\sqrt{6}$ b. $6\sqrt{2}$

   c. $9\sqrt{2}$ d. $\frac{3\sqrt{8}}{\sqrt{3}}$

2. Evaluate $\left(\frac{1}{2}\right)^{-3} \times \left(3^{-2}\right)$

   a. $\frac{1}{72}$ b. $\frac{9}{8}$

   c. $\frac{8}{9}$ d. 72

3. Simplify $\left(\frac{2x^3y}{x^2\left(y^2z\right)^4}\right)^{-1}$.

   a. $\frac{y^3z^4}{2x}$ b. $\frac{y^7z^4}{2x}$

   c. $\frac{2x}{y^3z^4}$ d. $\frac{2x}{y^7z^4}$

4. Evaluate $f(-3)$ if $f(x)=\frac{1-2x}{2+x}$.

   a. -7 b. 1

   c. -1 d. 5

5. Which function $H(t)$ represents the distance between a runner and the finish line, in meters, after t seconds if he starts 10 kilometers from the finish line and runs at a rate of 5 meters per second?

   a. $H(t)=10-5t$

   b. $H(t)=5t-10$

   c. $H(t)=10,000-5t$

   d. $H(t)=5t-10,000$

6. Solve $\frac{20}{x+1}=\frac{28}{x}$.

   a. $x=-4.5$ b. $x=-3$

   c. $x=-3.5$ d. $x=-2.5$

7. Which set of points could represent a linear function?

   a. $\{(1,10),(3,6),(5,2),(7,-4)\}$

   b. $\{(-1,1),(-2,4),(-3,9),(-4,16)\}$

   c. $\{(1,2),(2,5),(4,8),(8,11)\}$

   d. $\{(1,-3),(3,1),(5,5),(8,11)\}$

8. A line has slope $-\frac{3}{4}$ and passes through $(1,3)$. Which of these points is also on the line?

   a. $(-2,7)$ b. $(4,7)$

   c. $(-7,-3)$ d. $(13,-6)$

9. Which is the equation of the line perpendicular to $2x+3y=10$ and passing through $(2,-3)$?

a. $3x-2y=12$

b. $y=-\frac{3}{2}x-6$

c. $y=\frac{3}{2}x+10$

d. $y=-\frac{2}{3}(x-2)-3$

10. Solve $\frac{1}{2}|10-2x|\le 1$. (*Hint: Gory Land*)

a. $\{x \mid 4\le x\le 6\}$

b. $\{x \mid x\le 4 \text{ or } x\ge 6\}$

c. $\{x \mid -4\le x\le -6\}$

d. $\{x \mid x\le 6 \text{ or } x\ge 4\}$

11. Rupert's Rent-a-Car will rent you a car for $55 per day with no mileage charge. Mavis 'Mobiles-for-Rent will rent you a car for $34 per day plus 15 cents per mile beyond the first 100 miles. For what number of miles is the total cost of a one-day rental the same for both rent-a-car companies?

a. 140 b. 240

c. 210 d. 310

12. Solve $\begin{cases}2x+5y=19\\7x-3y=46\end{cases}$.

a. $(-3,6)$ b. $(7,1)$

c. $(4.5,2)$ d. $(12,-1)$

13. The Drama Club is selling pizza for a fund-raiser. They sell slices of cheese pizza for $1.25 and slices of pepperoni pizza for $1.50. Altogether they sell 150 slices for $208.50. How many slices of the pepperoni pizza did they sell?

a. 66 b. 78

c. 72 d. 84

14. On a feasible region whose vertices are $\{(0,0),(0,10),(3,8),(6,5),(13,0)\}$, what is the maximum of the objective function $R=3x+4y$, and where does it occur?

a. 39 at $(13,0)$ b. 41 at $(3,8)$

c. 40 at $(0,10)$ d. 44 at $(6,5)$

15. The system $\begin{cases}x+2y+4z=13\\2x+3y-z=7\\3x+y+2z=14\end{cases}$ is

a. inconsistent, with no solutions.
b. dependent, with infinitely many solutions.
c. independent, with one solution.
d. dependent, with one solution.

16. If $C=\begin{bmatrix} 4 & -1 \\ -1 & 2 \\ -3 & 3 \end{bmatrix}$ and $D=\begin{bmatrix} -2 & 2 \\ 3 & -3 \\ 1 & -1 \end{bmatrix}$, evaluate $C-2D$.

a. $\begin{bmatrix} 0 & 3 \\ 5 & -4 \\ -1 & 1 \end{bmatrix}$ b. $\begin{bmatrix} 8 & -5 \\ -7 & 8 \\ -5 & 5 \end{bmatrix}$

c. $\begin{bmatrix} 6 & -3 \\ -4 & 5 \\ -4 & 4 \end{bmatrix}$ d. $\begin{bmatrix} 10 & -4 \\ -5 & 7 \\ -7 & 7 \end{bmatrix}$

17. If $A=\begin{bmatrix} 2 & -1 \\ 1 & -2 \end{bmatrix}$, evaluate A^3.

a. $\begin{bmatrix} 6 & -1 \\ 1 & -6 \end{bmatrix}$ b. $\begin{bmatrix} 8 & -1 \\ 1 & -8 \end{bmatrix}$

c. $\begin{bmatrix} 6 & -3 \\ 3 & -6 \end{bmatrix}$ d. $\begin{bmatrix} 8 & -3 \\ 3 & -8 \end{bmatrix}$

18. The triangle $\triangle ABC$ has vertices $A(3,-1)$, $B(5,4)$, and $C(-2,3)$. What are the coordinates of the image of $\triangle ABC$ after it has been rotated using the rotation matrix $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$?

a. $A'(-3,1)$, $B'(-5,-4)$, $C'(2,-3)$

b. $A'(-1,-3)$, $B'(4,-5)$, $C'(3,2)$

a. $A'(1,-3)$, $B'(-4,-5)$, $C'(-3,2)$

a. $A'(1,3)$, $B'(-4,5)$, $C'(-3,-2)$

19. Which matrix is the inverse of $\begin{bmatrix} 2 & 1 \\ -3 & 3 \end{bmatrix}$?

a. $\begin{bmatrix} -\frac{2}{3} & -1 \\ \frac{1}{3} & -1 \end{bmatrix}$ b. $\begin{bmatrix} \frac{1}{3} & -\frac{1}{9} \\ \frac{1}{3} & \frac{2}{9} \end{bmatrix}$

c. $\begin{bmatrix} -\frac{2}{9} & -\frac{1}{3} \\ \frac{1}{9} & -\frac{1}{3} \end{bmatrix}$ d. $\begin{bmatrix} 1 & -\frac{1}{3} \\ 1 & \frac{2}{3} \end{bmatrix}$

20. The system of equations below represents the number of red, green, and blue cubes you will need to help your younger sister practice her addition and subtraction. Use x as the number of red cubes, y as the number of green cubes, and z as the number of blue cubes. What is the total number of cubes you will need to gather to help your sister?

$$\begin{cases} 2x+2y-z=16 \\ 3x-y=7 \\ 4y-3x=14 \end{cases}$$

a. 8 b. 19

c. 9 d. 20

21. Find the minimum or maximum of $g(x)=4x^2-12x+7$.

a. maximum of -2

b. maximum of 7

c. minimum of -2

d. minimum of 7

22. Write a quadratic function in standard form having zeros of 4 and $-\frac{1}{2}$.

a. $a(x)=2x^2-7x-4$

b. $b(x)=2x^2-7x+4$

c. $c(x)=2x^2+7x-4$

d. $d(x)=2x^2+7x+4$

23. Write $f(x)=x^2+4x-9$ in vertex form.

a. $f(x)=(x+2)^2-13$

b. $f(x)=(x+2)^2-9$

c. $f(x)=(x+4)^2-13$

d. $f(x)=(x+4)^2-9$

24. What are the solutions to $x^2+4x+13=0$?

a. $-2\pm 3i$ b. $-2\pm 6i$

c. $-2\pm\sqrt{17}$ d. $-2\pm i\sqrt{17}$

25. Jimmy is standing on the roof of his apartment building when he throws a ball straight upward over the edge. The ball is 55 feet above ground when he lets it go. The quadratic equation that models the path of the ball is $p(t)=-16t^2+24t+55$. How long does it take for the ball to hit the ground?

a. 1.25 seconds
b. 2.75 seconds
c. 2.25 seconds
d. 3.25 seconds

26. Simplify $\frac{2-4i}{1-i}$.

a. $1+3i$ b. $3-i$

c. $4-2i$ d. $2-5i$

27. Which is equal to $(2p+r)^4$?

a. $16p^4+r^4$

b. $16p^4+8p^3r+4p^2r^2+2pr^3+r^4$

c. $16p^4+32p^3r+16p^2r^2+4pr^3+r^4$

d. $16p^4+32p^3r+24p^2r^2+8pr^3+r^4$

28. Which is NOT a factor of $x^4-2x^3-7x^2+8x+12$?

a. $x-1$ b. $x-2$

c. $x+1$ d. $x+2$

29. List all the roots of $x^4+x^2=2$.

a. $\{\pm 1,\pm i\}$ b. $\{\pm 1,\pm\sqrt{2}\}$

c. $\{\pm 1,\pm i\sqrt{2}\}$ d. $\{\pm 1,\sqrt{2}\pm i\}$

30. If 4 and $2+\sqrt{5}$ are two of the roots of a fourth degree polynomial with integer coefficients, which of the following could be the set of all of the roots?

a. $\{2-\sqrt{5},\ 4,\ 2+\sqrt{5}\}$

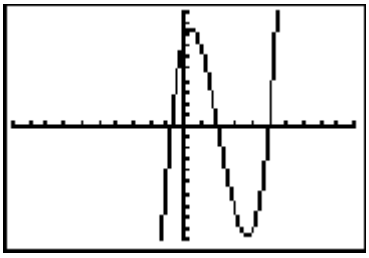
b. $\{2-\sqrt{5},\ \sqrt{5},\ 4,\ 2+\sqrt{5}\}$

c. $\{3,4,2+\sqrt{5},7\}$

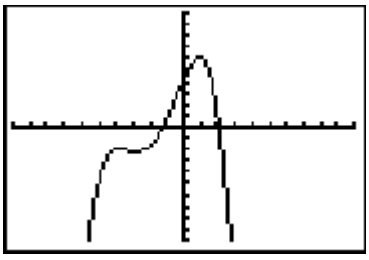
d. $\{2-\sqrt{5},3-\sqrt{2},4,3+\sqrt{2},2+\sqrt{5}\}$

31. If $A(x)$ and $B(x)$ are both quadratic functions with negative leading coefficients, and $C(x)$ is the product of $A(x)$ and $B(x)$, which of the following could be the graph of $C(x)$?

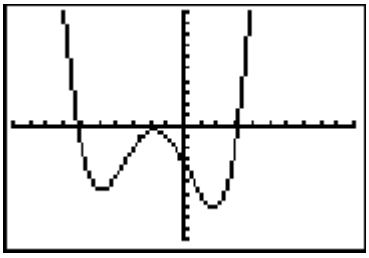
a.



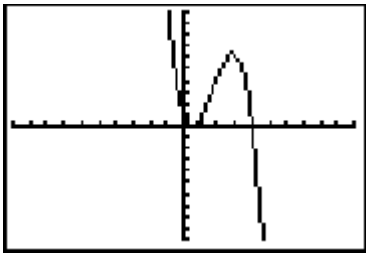
b.



c.



d.



32. If $f(x) = -x^3 + 2x^2 - 3x + 4$ and $g(x)$ is a translation of $f(x)$ two units to the right, which of the following is equal to $g(x)$?

a. $-x^3 - 4x^2 - 23x + 26$

b. $-x^3 - 4x^2 - 7x - 2$

c. $-x^3 + 8x^2 - 23x + 26$

d. $-x^3 + 8x^2 - 7x - 2$

33. The city of Eaton had a population of 45,000 in 1997 and then began to decrease in population at a rate of 1.5% per year. Which function expresses the population of Eaton in the year t?

a. $P(t) = 45{,}000(0.015)^t$

b. $P(t) = 45{,}000(0.015)^{t-1997}$

c. $P(t) = 45{,}000(0.985)^t$

d. $P(t) = 45{,}000(0.985)^{t-1997}$

34. Which of the following is the inverse of $f(x) = 3(5^x)$?

a. $f^{-1}(x) = \log_5 \frac{x}{3}$

b. $f^{-1}(x) = \frac{\log_5 x}{3}$

c. $f^{-1}(x) = 3\log_5 x$

d. $f^{-1}(x) = \log_{15} x$

35. Evaluate $\log_8 0.25$.

a. $-\frac{2}{3}$ b. $\frac{1}{32}$

c. $-\frac{1}{32}$ d. $\frac{2}{3}$

36. Simplify $\log_4 3+\log_4 12$.

a. $\frac{2\ln 6}{\ln 4}$ b. $\ln 36$

c. $\log_4 15$ d. $2\log_8 6$

37. Evaluate $f(4)$ if $f(x)=\frac{2^x}{\log_2 x}$.

a. 2 b. 8

c. 4 d. 16

38. The chart below shows the first, second, and third place finishes, and the total points earned by each of three schools competing in a track meet. How much is a first place finish in an event worth?

School	1st	2nd	3rd	Total
CHS	7	5	4	100
JHS	5	8	3	94
LHS	4	3	9	78

a. 7 b. 9

c. 8 d. 10

39. Which function has a maximum value of 10?

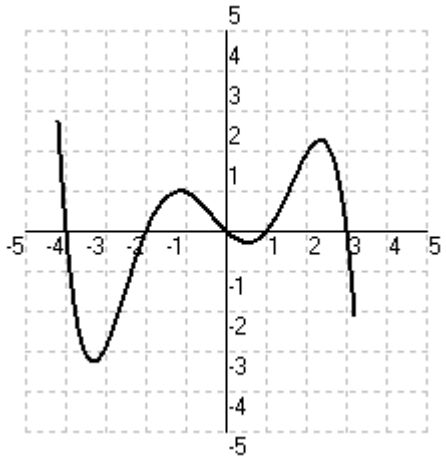
a. $a(x)=-2x^2+4x-12$

b. $b(x)=-2x^2+8x+2$

c. $c(x)=-x^2+6x+10$

d. $d(x)=x^2-4x+14$

40. Which statement MUST be true about the function graphed below?



a. Its leading coefficient is positive.
b. It has a pair of non-real roots.
c. Its constant term is zero.
d. It has a double root.

41. A radioactive material decays exponentially from 6 kg to 1.2 kg in 2 years. Which is the approximate constant of decay from this material?

a. -2.4 b. 0.8

c. -0.8 d. 2.4

42. The volume of a pentagonal prism can be modeled by $V = 6.88x^3 - 1.72x^2$. Which expression represents the area of the top of the prism if the height is $4x - 1$?

a. $0.57x^2$ b. $1.72x^2$
c. $2.28x^2$ d. $6.88x^2$

43. Subtract $\frac{1}{x-1} - \frac{7}{x^2+5x-6}$.

a. $\frac{-6}{x+6}$ b. $\frac{-1}{x^2+5x}$
c. $\frac{1}{x+6}$ d. $\frac{-6}{x^2+5x-6}$

44. Solve $|x-2|+1=7$.

a. $x=-4$ or $x=8$
b. $x=-8$ or $x=4$
c. $x=-8$ or $x=8$
d. $x=-4$ or $x=4$

45. Solve $y = z^x$ for x.

a. $\frac{\log z}{\log y}$ b. $\frac{z}{\log y}$
c. $\frac{\log y}{\log z}$ d. $\frac{y}{\log z}$

46. For which values of x is the expression $\frac{x^2+x-2}{x^2-4x+3}$ undefined?

a. -2 and 1 b. 3 and 1
c. -1 and 2 d. -3 and -1

47. $f(x) = x^3 - 6x^2 + 6x + 1$ has three real zeros. How many real zeros does $f(x) - 6$ have?

a. 3 b. 2
c. 1 d. 0

48. If $P = \begin{bmatrix} 2 & -1 & 4 \\ -1 & 3 & 0 \end{bmatrix}$ and $Q = \begin{bmatrix} 3 & 2 \\ 1 & 1 \\ -2 & 0 \end{bmatrix}$, evaluate PQ by hand.

a. $\begin{bmatrix} -3 & 3 \\ 0 & 1 \end{bmatrix}$ b. $\begin{bmatrix} 6 & -1 & 8 \\ -2 & 3 & 0 \end{bmatrix}$
c. $\begin{bmatrix} 6 & 8 \\ 2 & 0 \end{bmatrix}$ d. $\begin{bmatrix} 4 & 3 & 12 \\ 1 & 2 & 4 \\ -4 & 2 & -8 \end{bmatrix}$

49. Which function is the inverse of $f(x) = 4x - \frac{3}{4}$? Support your answer analytically.

a. $f^{-1}(x) = \frac{1}{4}x + 3$
b. $f^{-1}(x) = -\frac{1}{4}x + 3$
c. $f^{-1}(x) = -\frac{1}{4}x + \frac{3}{16}$
d. $f^{-1}(x) = \frac{1}{4}x + \frac{3}{16}$

50. Which of the following is a factor of $(a-1)^2 - b^2$?

a. $a+b-1$
b. $a-b$
c. $a-1$
d. $a-b+1$

Honors Precalculus 2008
Answer Sheet

Name _____

Choice e stands for "none of the above" and should be marked only if none of the solutions provided are correct.

1.	**a**	**b**	**c**	**d**	**e**
2.	**a**	**b**	**c**	**d**	**e**
3.	**a**	**b**	**c**	**d**	**e**
4.	**a**	**b**	**c**	**d**	**e**
5.	**a**	**b**	**c**	**d**	**e**
6.	**a**	**b**	**c**	**d**	**e**
7.	**a**	**b**	**c**	**d**	**e**
8.	**a**	**b**	**c**	**d**	**e**
9.	**a**	**b**	**c**	**d**	**e**
10.	**a**	**b**	**c**	**d**	**e**
11.	**a**	**b**	**c**	**d**	**e**
12.	**a**	**b**	**c**	**d**	**e**
13.	**a**	**b**	**c**	**d**	**e**
14.	**a**	**b**	**c**	**d**	**e**
15.	**a**	**b**	**c**	**d**	**e**
16.	**a**	**b**	**c**	**d**	**e**
17.	**a**	**b**	**c**	**d**	**e**
18.	**a**	**b**	**c**	**d**	**e**
19.	**a**	**b**	**c**	**d**	**e**
20.	**a**	**b**	**c**	**d**	**e**
21.	**a**	**b**	**c**	**d**	**e**
22.	**a**	**b**	**c**	**d**	**e**
23.	**a**	**b**	**c**	**d**	**e**
24.	**a**	**b**	**c**	**d**	**e**
25.	**a**	**b**	**c**	**d**	**e**

26.	**a**	**b**	**c**	**d**	**e**
27.	**a**	**b**	**c**	**d**	**e**
28.	**a**	**b**	**c**	**d**	**e**
29.	**a**	**b**	**c**	**d**	**e**
30.	**a**	**b**	**c**	**d**	**e**
31.	**a**	**b**	**c**	**d**	**e**
32.	**a**	**b**	**c**	**d**	**e**
33.	**a**	**b**	**c**	**d**	**e**
34.	**a**	**b**	**c**	**d**	**e**
35.	**a**	**b**	**c**	**d**	**e**
36.	**a**	**b**	**c**	**d**	**e**
37.	**a**	**b**	**c**	**d**	**e**
38.	**a**	**b**	**c**	**d**	**e**
39.	**a**	**b**	**c**	**d**	**e**
40.	**a**	**b**	**c**	**d**	**e**
41.	**a**	**b**	**c**	**d**	**e**
42.	**a**	**b**	**c**	**d**	**e**
43.	**a**	**b**	**c**	**d**	**e**
44.	**a**	**b**	**c**	**d**	**e**
45.	**a**	**b**	**c**	**d**	**e**
46.	**a**	**b**	**c**	**d**	**e**
47.	**a**	**b**	**c**	**d**	**e**
48.	**a**	**b**	**c**	**d**	**e**
49.	**a**	**b**	**c**	**d**	**e**
50.	**a**	**b**	**c**	**d**	**e**