TMTA
Algebra II
2008

1. Simplify the expression. $8-(8x-2)-4(7-2x)+x$

A. x - 18
B. -15x - 24
C. -55x - 12
D. x - 22
E. -15x - 34

2. Solve the equation. $\frac{3}{4}x+2=\frac{2}{3}x-4$

A. x = 6
B. x = -24
C. x = -72
D. x = -20
E. x = -6

3. The US Congress is made up of 100 members. The number of republicans is 20 less than 3 times the number of Democrats. How many Republicans are there?

A. 30
B. 60
C. 40
D. 70
E. 25

4. Solve for A and B. $Ax + By = -2x + 3(3 - 5y) - 3^2$

A. A = -2 B = 15
B. A = 7 B = -24
C. A = 2 B = -15
D. A = -2, B = 4
E. A = -2 B = -15

5. If opening valve A will fill a swimming pool in 8 hours and opening valve B will fill the same pool in 5 hours, how much time is required to fill the pool if both valves are opened simultaneously?

A. $\frac{13}{2}$ hours
B. $\frac{40}{13}$ hours
C. $\frac{13}{40}$ hours
D. $5\frac{3}{8}$ hours
E. 3 hours

6. Simplify the expression. $(2 + 3i)(1 - i) + (2 + i)$

A. 7 + 2i
B. 6 + 9i
C. 4 + 4i
D. 9 - i
E. 5 + 3i

7. Find the equation of the line that passes through the point (2, 3) and is perpendicular to the line 4x + 12y = 0.

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

B. $y = 3x - 3$

C. $y = 2x - 3$

D. $y = \frac{1}{3}x - 2$

E. $y = -\frac{1}{3}x + \frac{1}{4}$

8. Solve the equation. $(2x + 3)^2 = -9$

A. $x = -\frac{3}{2} \pm \frac{3}{2}i$

B. x = 3, -6

C. x = 0, -3

D. $x = \frac{3}{2} \pm \frac{3}{2}i$

E. x = 6

9. How much of a 40% acid solution should be mixed with pure water to obtain 80 ml of a 30% acid solution?

A. 24 ml
B. 28 ml
C. 32 ml
D. 60 ml
E. 80 ml

10. Find the domain for $f(x) = (x^2 + 4x + 3)^{1/2}$?

A. $x \le -3 or\ x \ge -1$
B. $-4 \le x \le 3$
C. $x \ge -3$
D. $1 \le x \le 3$
E. $x \ge 0$

11. Factor completely. $3a^4b - 3ab^4$

A. $3ab(a^3 - b^3)$
B. $3(a^2 + b^2)(a + b)(a - b)$
C. $3ab(a - b)(a^2 - ab + b^2)$
D. $3ab(a - b)(a^2 + ab + b^2)$
E. Prime

12. The cost for one print run of a book is jointly proportional to the number of pages in the book and the number of books in the print run. If it costs $20,000 to print 400 copies of a 100 page book, what is the cost to print 400 copies of a 293 page book?

A. $68,260
B. $117,200
C. $23,440
D. $58,600
E. $146,500

13. Simplify the expression. $\dfrac{\left(\frac{1}{3}\right)^{-2} - (-3)^{-1}}{\left(\frac{1}{2}\right)^{-1} - (-2)^{-2}}$

A. $\frac{112}{27}$

B. $\frac{16}{9}$

C. $\frac{16}{3}$

D. $\frac{104}{21}$

E. $-\frac{8}{9}$

14. Solve the equation. $\dfrac{4}{x^2+3x-10} - \dfrac{1}{x^2+x-6} = \dfrac{3}{x^2-x-12}$

A. $x = \frac{19}{6}$

B. $x = -\frac{19}{6}$

C. $x = \frac{1}{7}$

D. $x = -\frac{1}{7}$

E. No solution

15. If $f(x) = x^4 - 2x^3 + 3x + 4$ and $g(x) = 5x$, then what is $g \circ f$?

A. $x^5 - 10x^4 + 3x^2 + 4x$

B. $5x^4 - 10x^3 + 15x + 20$

C. $5x$

D. $625x^4 - 250x^3 + 15x + 4$

E. $5x^5 - 10x^4 + 15x^2 + 20x$

16. Solve the equation. $\log_2(x+1) = 3$

A. x = 2
B. x = 9
C. x = 8
D. x = 7
E. x = 10

17. A six-sided die has 2 blue faces, 1 red face, and 3 yellow faces. If the die is rolled twice, what is the probability that both rolls will result in a blue face?

A. $\frac{1}{3}$
B. $\frac{1}{9}$
C. $\frac{2}{3}$
D. $\frac{1}{6}$
E. $\frac{1}{4}$

18. What is the radius of a circle with an area of 10 square inches?

A. 1.78 inches
B. 3.18 inches
C. 10.13 inches
D. 5.60 inches
E. 1.01 inches

19. Which of the following is equal to $\sqrt[3]{\frac{x^3+x^3y^3}{y^3z^4}}$?

A. $\frac{x+xy}{yz\sqrt[3]{z}}$

B. $\frac{x}{yz}\sqrt[3]{\frac{2}{z}}$

C. $\frac{x(1+y)\sqrt[3]{z^2}}{yz^2}$

D. $\frac{x\sqrt[3]{z^2(1+y^3)}}{yz^2}$

E. $\sqrt[3]{\frac{x+xy}{yz^{4/3}}}$

20. If the point (2,1) is the midpoint of the line segment $\overline{AB}$ and A has coordinates $\left(-\frac{1}{2},6\right)$, then the coordinates of B are

A. $\left(\frac{9}{2},-4\right)$

B. $(-3,11)$

C. $\left(\frac{3}{4},\frac{7}{2}\right)$

D. $\left(\frac{5}{4},\frac{5}{2}\right)$

E. $\left(-\frac{7}{2},-4\right)$

21. If $\log 3 = A$ and $\log 7 = B$, then, in terms of A and B, $\log_7 9 =$

A. $\frac{2A}{B}$

B. $2A - B$

C. $\frac{2B}{A}$

D. $\left(\frac{A}{B}\right)^2$

E. $\frac{B}{2A}$

22. Find the center and radius of the circle: $x^2 + y^2 + 3x - 2y - 1 = 0$

A. $C = \left(\frac{3}{2}, \frac{1}{2}\right)\ r = \frac{\sqrt{17}}{4}$

B. $C = (3, -2)\ r = 1$

C. $C = \left(-\frac{3}{2}, 1\right)\ r = \frac{\sqrt{13}}{4}$

D. $C = \left(-\frac{3}{2}, 1\right)\ r = \frac{\sqrt{17}}{2}$

E. $C = (-3, 2)\ r = 1$

23. Solve the inequality. $3\left|2x-1\right|+7\geq 13$

A. $\left[\frac{3}{2},\infty\right)$

B. $\left[-\frac{1}{2},\frac{3}{2}\right]$

C. $\left(-\infty,-\frac{3}{2}\right]\cup\left[\frac{1}{2},\infty\right)$

D. $\left(-\infty,-\frac{1}{2}\right]$

E. $\left(-\infty,-\frac{1}{2}\right]\cup\left[\frac{3}{2},\infty\right)$

24. Solve the equation. $3p^{3/2}=24$

A. 4

B. $16\sqrt{2}$

C. $\frac{4\sqrt[3]{3}}{3}$

D. 16

E. $\frac{16}{3}$

25. Find the standard form of the equation of a parabola that has a vertical axis of symmetry, x-intercepts of -3 and 5, and the y-coordinate of the maximum is 4.

A. $y = -\frac{3}{4}(x+1)^2 - 4$

B. $y = -(x-4)^2 + 1$

C. $y = -\frac{1}{4}(x-1)^2 + 4$

D. $y = -3x^2 + 5$

E. $y = -\frac{3}{4}(x+1)^2 + 5$

26. $\log_3 5 = ?$

A. $\ln \frac{3}{5}$

B. $\frac{\log 3}{\log 5}$

C. $3\log 5$

D. $\log \frac{5}{3}$

E. $\frac{\ln 5}{\ln 3}$

27. What is the coefficient of x^5 in the expansion of $(2x+.5)^{10}$?

A. 1

B. 16

C. 32

D. 252

E. 1024

28. Solve the equation. $27^{2t-1} = 81^{t+2}$

A. 3

B. -3

C. $-\frac{1}{2}$

D. -2

E. $\frac{11}{2}$

29. Solve the equation. $\ln x + \ln(2x-1) = 7$

A. $\frac{1+\sqrt{57}}{4}$

B. $\frac{e^7}{2e^7-1}$

C. $\frac{1+\sqrt{1+8e^7}}{4}$

D. $\frac{1+3e^e\sqrt{e}}{4}$

E. $\frac{e^7}{2e^7-1}$

30. The lengths of the three sides of a right triangle are consecutive multiples of three. What is the area of the triangle?

A. 108
B. 54
C. 36
D. 90
E. 45

31. The Family Arts Center charges $21 for adults, $12 for senior citizens, and $9 for children under 12 for their live performances on Sunday afternoons. This past Sunday, the paid revenue was $10,530 for 769 tickets sold. There were 42 more children than adults. How many children attended?

A. 251
B. 280
C. 238
D. 270
E. Cannot be determined with the given information

32. The size P of a small herbivore population at time t (in years) obeys the function $P(t) = 800e^{0.22t}$ if they have enough food and the predator population stays constant. After how many years will the population reach 2400?

A. 9.54 years
B. 33.54 years
C. 4.99 years
D. 12.6 years
E. 3.74 years

33. If $f(x)=\dfrac{2x-3}{x+1}$, find $f^{-1}(-2)$.

A. $x=-\dfrac{5}{4}$

B. $x=\dfrac{1}{4}$

C. $x=-\dfrac{1}{4}$

D. $x=0$

E. No solution

34. Find the zeros for $f(x)=x^3+7x^2+llx-3$.

A. $\{3,\ -2\pm\sqrt{5}\}$

B. $\{-3,\ -2\pm\sqrt{3}\}$

C. $\{-3,\ 2\pm\sqrt{5}\}$

D. $\{3,\ 2\pm\sqrt{5}\}$

E. $\{-3,\ -2\pm\sqrt{5}\}$

35. Simplify. $\sqrt{-20}\,(3+\sqrt{-25})$

A. $4\sqrt{5}$

B. $-20+12i$

C. $-10\sqrt{5}+6i\sqrt{5}$

D. $10\sqrt{5}+6i\sqrt{5}$

E. $2i\sqrt{15}+10\sqrt{5}$

36. Given $f(x) = 2x^2 + 5x$, find $\dfrac{f(x+h) - f(x)}{h}$.

A. 2h + 5

B. 6

C. $\dfrac{2x^2 + 8xh + 4h^2 + 5h}{h}$

D. Undefined

E. 4x + 2h + 5

37. The Fundamental Theorem of Algebra states that if $f(x)$ is a polynomial of degree n, where $n \geq 1$, then

A. the equation $f(x) = 0$ has at least one real root.
B. the equation $f(x) = 0$ has at least one real and one complex root.
C. the equation $f(x) = 0$ has at least one complex root.
D. the equation $f(x) = 0$ has n distinct roots.
E. the equation $f(x) = 0$ has $n+1$ distinct roots

38. You have k feet of fencing to enclose a rectangular plot that borders on a river, where k is a constant, positive real number. If you do not fence the side along the river, what is the maximum rectangular area, in terms of k, that can be enclosed?

A. $\dfrac{k}{3}\ ft^2$

B. $\dfrac{k^2}{9}\ ft^2$

C. $\dfrac{k}{4}\ ft^2$

D. $\dfrac{k^2}{8}\ ft^2$

E. $(-2w^2 + kw)\ ft^2$

39. Find the product. $\begin{bmatrix} 8 & 1 \\ 2 & -5 \end{bmatrix}^2$.

A. $\begin{bmatrix} 66 & 3 \\ 6 & 27 \end{bmatrix}$

B. $\begin{bmatrix} 64 & 1 \\ 4 & 25 \end{bmatrix}$

C. $\begin{bmatrix} 66 & 3 \\ 6 & -23 \end{bmatrix}$

D. $\begin{bmatrix} 66 & 3 \\ -26 & -23 \end{bmatrix}$

E. $\begin{bmatrix} 64 & 3 \\ 6 & 27 \end{bmatrix}$

40. Which hyperbola has asymptotes $y = \pm\frac{3}{4}x$?

A. $\frac{x^2}{9} - \frac{y^2}{16} = 1$

B. $\frac{y^2}{3} - \frac{x^2}{4} = 1$

C. $\frac{y^2}{16} - \frac{x^2}{9} = 1$

D. $\frac{x^2}{3} - \frac{y^2}{4} = 1$

E. $\frac{x^2}{16} - \frac{y^2}{9} = 1$

Extra problems. Algebra II - 2008

1. Solve the equation. $\sqrt{x-4}+\sqrt{x+1}=5$

A. x = 4
B. x = 14
C. x = 8
D. x = 0
E. No solution

2. Perform the indicated operation. $\dfrac{9-8i}{8+4i}$

A. $\dfrac{1}{24}+\dfrac{5}{48}i$

B. $\dfrac{1}{2}-\dfrac{5}{4}i$

C. $\dfrac{13}{6}+\dfrac{5}{48}i$

D. $26+7i$

E. $\dfrac{5}{6}-\dfrac{25}{12}i$

3. Which of the following functions is an odd function?

A. $f(x)=3x^4-2x^2+5$
B. $f(x)=|x|$
C. $f(\theta)=\cos\theta$
D. $f(x)=2x^5-x^3+x$
E. $f(x)=x^2\sqrt{1-x^2}$

Answer Key. Algebra II – 2008

1. A
2. C
3. D
4. E
5. B
6. A
7. B
8. A
9. D
10. A
11. D
12. D
13. C
14. C
15. B
16. D
17. B
18. A
19. D
20. A
21. A
22. D
23. E
24. A
25. C
26. E
27. D
28. E
29. C
30. B
31. B
32. C
33. B
34. E
35. C
36. E
37. C
38. D
39. A
40. E

Extra.

1. C
2. B
3. D