CC Math 3 Honors

Final Exam – Summer 2014

Name _____ August 5, 2014

I attest that I received no assistance in completing this test other than from my own teacher and used no electronics other than a graphing calculator.

Signature: _____

Answers

| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. |
|---|---|---|---|---|---|---|---|
| 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. |
| 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. |
| 25. | 26. | 27. | 28. | 29. | 30. | 31. | 32. |
| 33. | 34. | 35. | 36. | 37. | 38. | 39. | 40. |
| 41. | 42. | 43. | 44. | 45. | 46. | 47. | 48. |
| | | | | | | | |

This exam is entirely calculator active.

1. Which of the following is a polynomial with real coefficients that has 2-$i$ and 2 as zeros?

   a. (x + 2)(x − 2 − $i$)
   b. (x − 2)(x + 2 + $i$)
   c. (x − 2)(x² − 4x + 5)
   d. (x − 2)(x² − 4x − 5)

2. If $f$ is an exponential function with $f(0) = 3$ and $f(2) = 12$, then

   a. $f(x) = 2(3)^x$    b. $f(x) = 3(2)^x$    c. $f(x) = 3(12)^x$    d. $f(x) = 3x^2$

3. Suppose that $p(x)$ is a polynomial with degree 5 and has a root of $1 - 2i$. Which of the following is true?

   a. $p(x)$ has 4 real roots.

   b. $p(x)$ has at least 3 real roots.

   c. $p(x)$ has no real roots.

   d. $p(x)$ has at least one real root.

4. Let $f(x) = \dfrac{x-1}{x^2 - 4}$. What are the asymptotes of the function?

   a. $y = 1, x = 2, x = -2$

   b. $x = 1, y = 2, y = -2$

   c. $y = 0, x = 2, x = -2$

   d. $x = 2, x = -2$

   e. There are no asymptotes.

5. The following three transformations are applied (in the given order) to the graph y = x²

      I.     A vertical stretch by a factor of 3.
      II.    A horizontal shift right 5 units
      III.   A vertical shift down 6 units

Which of the following is an equation for the graph produced as a result of applying these   transformations?

a)  y = 3(x − 5)² − 6
b)  y = 3(x + 5)² − 6
c)  y = 3(x − 6)² + 5
d)  y = -3(x - 5)² + 6

6. Solve $\log_4 x = \dfrac{1}{2}$.

  a.  $x = \frac{1}{16}$      b.  $x = \pm 2$    c.  $x = 2$    d.  $x = 8$    e.  $x = 16$

7. Solve the inequality $\dfrac{3x+2}{(x+1)(2x)} \geq 0$.

  a)  -1< x <$\frac{-2}{3}$ $and$ x > 0       b)  x < -1 and x > 0
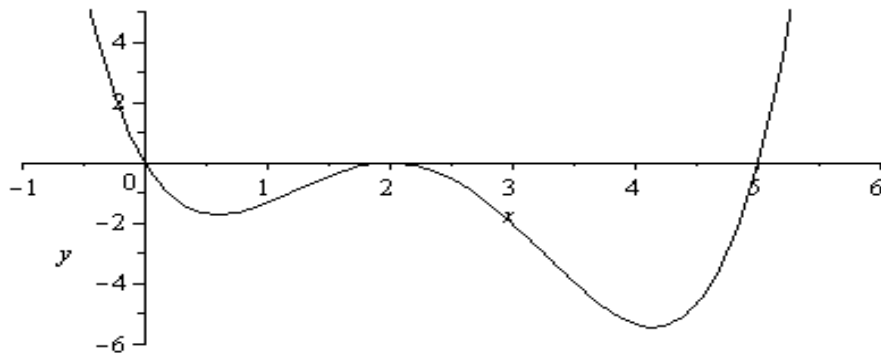  c)  -1< x ≤ $\frac{-2}{3}$ and x >0      d)  -1≤ x ≤ $\frac{-2}{3}$ and $x \geq 0$

8. Find the domain of $(f \circ g)(x)$, if $f(x) = x^2 + 3$ and $g(x) = \sqrt{x-4}$.

  a. All real numbers      b. x ≥ 0    c. $x \leq -1\ and\ x \geq 1$    d. x≥ 4

9. The graph of $f(x) = \dfrac{x^3 + x^2 - 3x - 2}{x^2 - 1}$ has a slant asymptote of

  a.  $y = x + 1$.                             b.  $y = -2x - 1$.

  c.  $y = 1$.                                d.  $x = 1$.

10. Which of the following could be an equation for the graph below?



a. $f(x) = -2x(x-2)^2(x-5)$

b. $f(x) = 2x(x-2)^2(x-5)$

c. $f(x) = -2x(x-2)(x-5)$

d. $f(x) = 2x^2(x-2)(x-5)$

11. What are the real solutions to the equation $\log_3 x + \log_3(x-6) = 3$?

    a. $x = 17$    b. $x = -3, x = 9$    c. $x = 9$    d. no real solutions

12. If the population of Knightdale was 9,000 in 1990 and grew with a yearly exponential growth rate of 3.6%, how many people to the nearest thousand would be expected to live in Knightdale in 2005?

    a. No one wants to live in Knightdale.

    b. About 15,000 people.

    c. About $2.5 \times 10^{28}$ people.

    d. About 5,000 people.

    e. About 13,000 people.

13.  Given that $\ln A = a$, $\ln B = b$, and $\ln C = c$, then $\ln \dfrac{\sqrt{A}}{B^3 C^2} =$

   a.  $\sqrt{a} - b^3 - c^2$
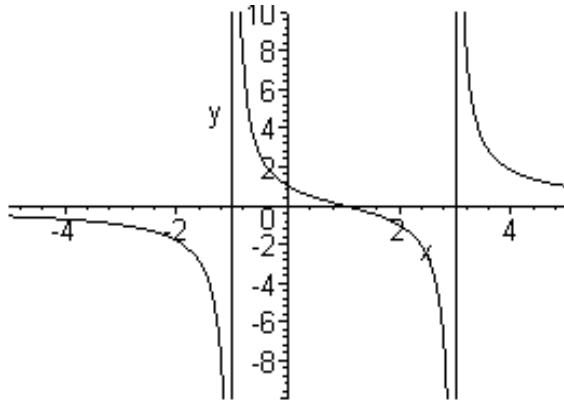
   b.  $\sqrt{a} - b^3 c^2$

   c.  $\dfrac{1}{2}a - 3b + 2c$

   d.  $\dfrac{1}{2}a - 3b - 2c$

14. The radius of the circle with equation $x^2 + 4x + y^2 - 5y = 25$ is

   a.  25    b.  5    c.  $\dfrac{141}{4}$    d.  $\dfrac{\sqrt{141}}{2}$

15.  If the graph of a rational function is given below, what is a possible equation for the function?



A.  $f(x) = \dfrac{x}{x^2 - 4}$

B.  $f(x) = \dfrac{1}{(x+1)(x-3)}$

C.  $f(x) = \dfrac{x-1}{(x+1)(x-3)}$

D.  $f(x) = \dfrac{(x-1)^2}{(x+1)(x-3)}$

16. Use the properties of logarithms to write the expression
    $3 \log(x + 8) - 2 \log(x - 5)$ as a single logarithm.

   a) $6 \log(x + 8)(x - 5)$
   b) $\log \frac{3(x+8)}{2(x-5)}$
   c) $\log(x + 8)^3(x - 5)^2$
   d) $\log \frac{(x+8)^3}{(x-5)^2}$

17. Let $f(x) = \frac{3x+7}{x-2}$. Find the $f^{-1}$.

   a) $\frac{2x+7}{x-3}$        b) $\frac{3x+7}{x-2}$        c) $\frac{2x-7}{x+3}$        d) f(x) does not have an inverse.

18. What is the explicit rule for the sequence -8, -3, 2, 7, ...?

   a) $a_n = -3 + 5n$     b) $a_n = -8(5)^{n-1}$     c) $a_n = 5n - 13$        d) $a_n = -8 + 5n$

19. The sequence 2, 6, 18, 54, ..., is geometric. What is its explicit rule?

   a) $a_n = 2(3)^n$       b) $a_n = 3^{n-1}$         c) $a_n = 2(3)^{n-1}$          d) $a_n = 6(3)^{n-1}$

20. A single cell amoeba doubles every 4 days. How long would it take one
    amoeba to produce a population of about 10,000 amoebae?

   a) 9.2 days       b) 13.3 days          c) 53.2 days          d) 83.2 days

21. What is the period of $y = 3 + \frac{1}{2} \cos(4x)$?

   a) $4\pi$               b) $2\pi$                c) $\frac{\pi}{2}$                    d) $\frac{\pi}{4}$

22. Find the amplitude of the graph of $y = 3 + 2 \cos(x - \pi)$.

   a) a = 3
   b) a = 2
   c) a = $\pi$
   d) a = 1

23.    The third and fourth terms of a geometric sequence are -18 and 54, respectively. What is the first term of the sequence?

a) -3　　　　　b) -2　　　　　c) 2　　　　　d) 3

24. Determine the sixth partial sum of the geometric sequence $5, \frac{5}{4}, \frac{5}{16}, \dots$

a) 6.67　　　　b) 6.48　　　　c) $\frac{5}{1024}$　　　　d) $\frac{5}{4096}$

25. Find the sum of the first 12 terms of the arithmetic sequence 28, 22, 16, 10, …

a) -10　　　　b) -12　　　　c) -22　　　　d) -60

26. Find the range of the graph of $y = 6 \sin \pi x$.

a) $-\pi \leq y \leq \pi$
b) $-6 \leq y \leq 6$
c) $-3 \leq y \leq 3$
d) *All real numbers*

27.    The expression $(3- 7i)^2$ is equivalent to

a) $-40$　　　　b) $-40 - 42i$　　　　c) 58　　　　d) $58 - 42i$

28. Some researchers believe that too much iron in the blood can raise the level of cholesterol.  Making periodic blood donations can lower the iron level in the blood.  A study is performed by randomly selecting half a group of volunteers to five periodic blood donations while the rest do not.  Is this an experiment or an observational study?

 a) An experiment with a control group.
 b) An experiment with volunteer bias.
 c) An observational study with randomization
 d)  An observational study with little bias

29. Consider the following two normal curves:
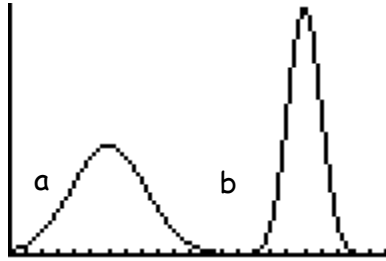


Which has the larger mean and which has the larger standard deviation?

    a) Larger mean a; larger standard deviation a
    b) Larger mean a; larger standard deviation b
    c) Larger mean b; larger standard deviation a
    d) Larger mean b; larger standard deviation b


30. An insurance company charges $800 annually for car insurance. The policy specifies that the company will pay $1000 for a minor accident and $5000 for a major accident. If the probability of a motorist having a minor accident during the year is .2, and of having a major accident, .05, how much can the insurance company expect to make on the policy?

a) $200        b) $250        c) $300        d) $350        e) $450


31. A large medical professional organization with membership consisting of doctors, nurses, and other medical employees wanted to know how its members felt about HMOs (health maintenance organizations). They randomly selected ten cities from all cities in which its members lived, and then surveyed all members is those cities. What type of sampling design is this?

    a) Simple random sampling
    b) Systematic random sampling
    c) Stratified random sampling
    d) Cluster sampling
    e) Convenience sampling

32. The medical professional organization decided to undertake a survey of its membership by placing the survey on its website instead. What is the source of bias that the organization will encounter with this sampling procedure?

   a) Response bias
   b) Non-response bias
   c) Self-selection bias
   d) Question wording bias
   e) Measurement bias

33. The income per household in a certain state is normally distributed with a mean $9500 and a standard deviation of $1750.  The middle 95% of incomes are between what two values?

   a) $5422 and $13,578          d) $7260 and $11,740
   b) $6070 and $12,930          e) $8049 and $10,951
   c) $6621 and $12,379

34. A z-score is called a standardized score because you can

   a) translate any x-value into a z-score.
   b) translate any x-value from a normal distribution into a z-score.
   c) translate z-scores into a proportion, a percentile, or a probability of the normal curve.
   d) use z-scores to find the area between a z-score and the mean, or the area below a z-score.
   e) use them to compare x-values to a universal standard, in this case, the standard normal distribution.

35. Environmental Protection Agency estimates for fuel economy for automobile models tested recently predicted a mean of 24.8 mpg and a standard deviation of 6.2 mpg for highway driving.  The data is normally distributed. About what percent of cars should get between 31 mpg and 37.2 mpg?

   a)  13.5 %          b) 16%          c)  95%          d) 36.5%

36. In parallelogram ABCD m<A = 2x + 5 and m<B = 3x + 15. What is m<C?

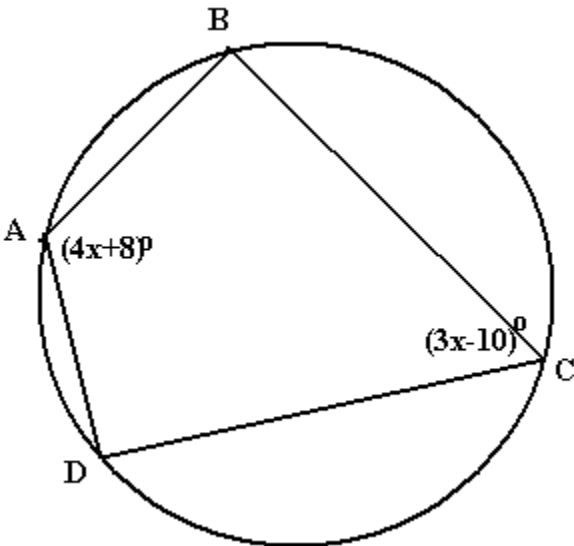    a) 69°               b) 60°               c) 45°               d) 32°


37. In rectangle ABCD the lengths of the sides are 14 cm and 48 cm. What is the length of a diagonal?

    a) 62 cm           b) 50 cm           c) 25 cm           d) 2500 cm


38. Given the inscribed quadrilateral ABCD, what is the $m\widehat{BAD}$?

    a) 26°               b) 68°               c) 136°            d) 180°



39. Find the equation of the parabola with focus at (2, 6) and directrix at y = 2.

    a) Y = 2(x − 2)² + 4
    b) Y = 4(x-2)² + 4
    c) Y = ¼ (x − 2)² + 4
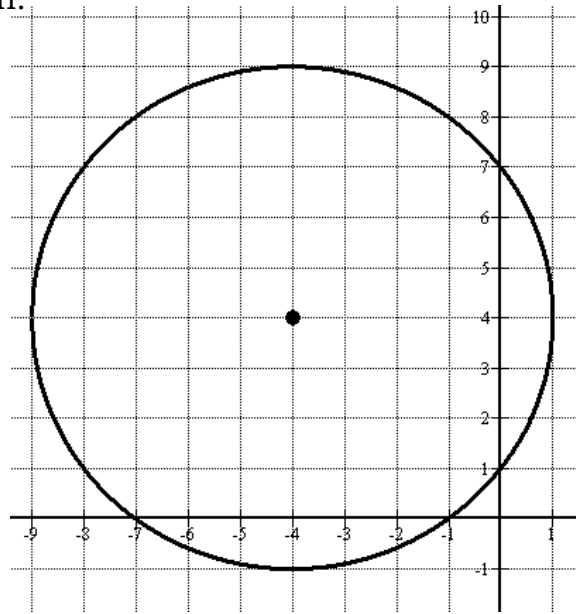    d) Y = 1/8 (x − 2)² +4

40. Find the equation of the circle shown.

a) $x^2 + y^2 - 8x + 8y + 57 = 0$

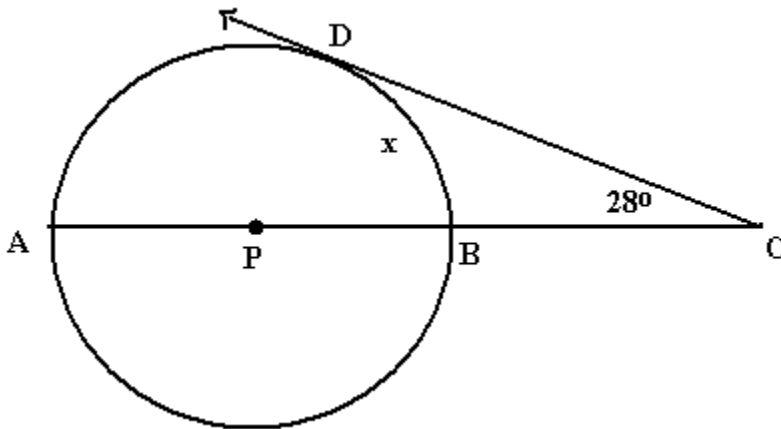b) $x^2 + y^2 - 8x + 8y + 7 = 0$

c) $x^2 + y^2 + 8x - 8y + 7 = 0$

d) $x^2 + y^2 + 8x - 8y + 57 = 0$



41. $\overline{AB}$ is the diameter of circle P, $\overrightarrow{DC}$ is tangent to the circle at D, and m<C = 28°. Find the $m\widehat{BD}$.
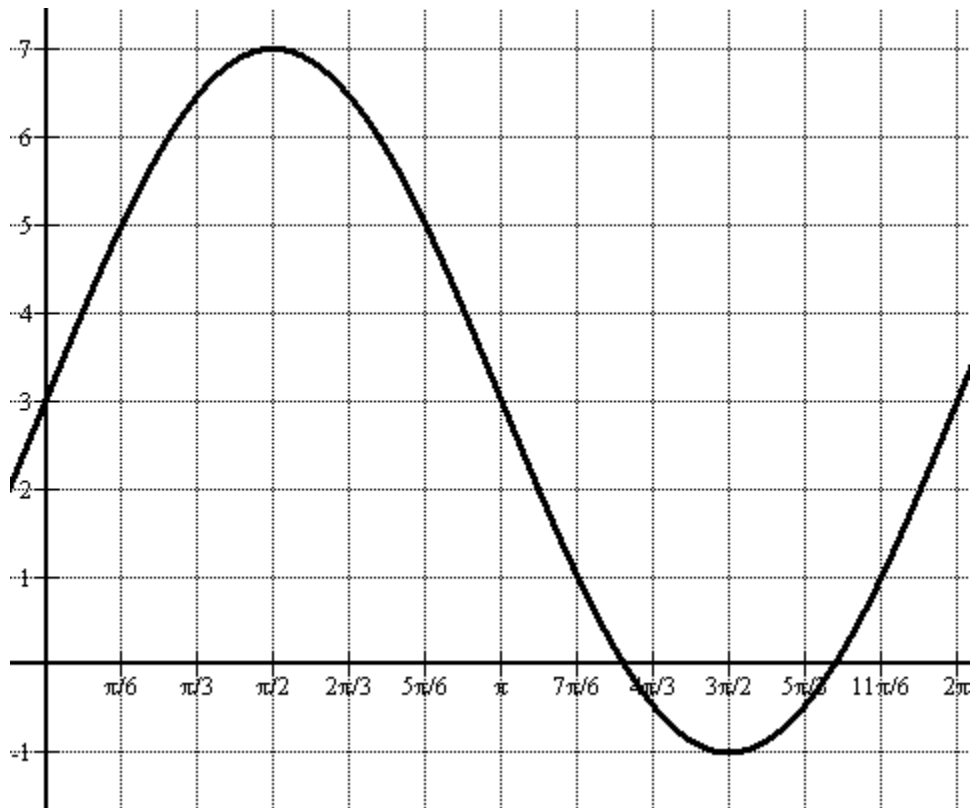


a) 56°        b) 62°        c) 118°        d) Not enough information

42. What is the equation of the sine function in the graph shown?



a) $y = 4 \sin(x) + 3$

b) $y = 3 \sin(x) + 3$

c) $y = 4 \sin(x) + 1$

d) $y = 4 \sin(2x)$

43. Jaclyn wants to make vases and bowls for her pottery business. Each vase takes 1 pound of clay and each bowl takes ½ pound of clay. It takes her 30 minutes to make a vase or a bowl. She has 6 pounds of clay available and 4 hours of available time. What are the constraint equations for Jaclyn's situation? Let v = number of vases made and b = number of bowls made.

a) v + b ≤ 4
    v + ½ b ≤6
    v ≥ 0
    b ≥ 0

b) ½ v + ½ b ≤ 4
    v + ½ b ≤ 6
    v > 0
    b > 0

c) ½ v + ½ b ≤4
    v + ½ b ≤ 6
    v≥ 0
    b ≥ 0

d) 30v + 30b ≤ 4
    v + 30b ≤6
    v≥ 0
    b ≥ 0

44. A grocery store clerk set up a display of 12-pack cartons of cola. There are 15 cartons in the base of the triangle and one at the top. There is one less carton in every row. How many cartons of cola are needed to complete the display?

a) 180 cartons     b) 30 cartons     c) 120 cartons     d) 15 cartons

45. Which of the following is **NOT** a rational zero of $f(x) = 2x^3 - x^2 - 23x - 20$?

a) 1       b) -1       c) 4       d) – 5/2

46.

A student was asked to express the sum $\dfrac{2}{3}+\dfrac{3}{4}+\dfrac{4}{5}+\dfrac{5}{6}+\dfrac{6}{7}$ using sigma notation. The student produced four answers. Which of the four answers is NOT correct?

a) $\displaystyle\sum_{k=3}^{7}\frac{k-1}{k}$       b) $\displaystyle\sum_{k=1}^{5}\frac{k+1}{k+2}$

c) $\displaystyle\sum_{k=1}^{5}\frac{k}{k+1}$       d) $\displaystyle\sum_{k=2}^{6}\frac{k}{k+1}$

47. Solve the equation $\sqrt{5 - 2x} = 5$.

    a) x = -10        b) x = -12        c) x = 12        d) no solution

48. Solve: $4^{x + 2} = 8^{5-2x}$.

    a) x = 1.1        b) x = .909        c) x = 1.6        d) x = 1.375

49. Describe the nature of the roots of $x^3 - 3x^2 + 4x - 12$.

  a) 3 positive real roots OR 1 positive real root and two imaginary roots

  b) 1 negative real root and 2 positive real roots OR 1 negative real root and 2 imaginary roots

  c) 3 imaginary roots

  d) 1 negative real root, 1 positive real root and one imaginary root

50. Determine the discriminant of $f(x) = 3x^2 - 7x - 48$ and the type of roots of this polynomial.

  a) Two rational roots
  b) One real, double root
  c) Two irrational roots
  d) Two imaginary roots