

THETA WRITTEN TEST

1994 MAΘ NATIONAL CONVENTION

NAME

KEY

CODE _____

Calculators are not allowed on this test. All answers must be in simplest form.

ANSWERS

1. Solve the system:

$$y = 2 \log_2 x - 1$$

$$y = 4 \log_2 x + 3$$

1. $(\frac{1}{4}, -5)$

2. At precisely what time between 7 and 8 o'clock is the minute hand exactly over the hour hand?

2. $7:38\frac{2}{11}$

3. Solve the following: $72x^3 - 66x^2 - 195x = 0$

3. $\{0, \frac{13}{6}, -\frac{5}{4}\}$

4. Find the coordinates of the circumcenter of the triangle with vertices (5, 6), (-1, 2), and (3, -4)

4. $(4, 1)$

5. Find the domain of the function $f(x) = \sqrt{\frac{4 - x^2}{x^2 + 2x - 15}}$.

5. $-5 < x \leq -2$
or $2 \leq x < 3$

6. Find in $a + bi$ form $(\frac{1}{2} - \frac{\sqrt{3}}{2}i)^6$

6. 1

7. A candy store owner wishes to mix candy worth \$0.88 per pound with candy worth \$0.96 per pound to create a 12-pound mixture worth \$0.91 per pound. How much of each type of candy should he use?

7. $4\frac{1}{2}$ lbs at 96¢/lb
 $7\frac{1}{2}$ lbs at 88¢/lb

8. Find the exact area of a quadrilateral with vertices (in order) (1, 2), (2, 5), (4, 3) and (3, -1)

8. $\frac{19}{2}$

9. Find the radius of the sphere with the given equation.

$$2x^2 + 2y^2 + 2z^2 - 4x - 6y + 7z + \frac{1}{8} = 0$$

9. $\frac{5}{2}$

10. Simplify completely:

$$\sqrt{49 + 12\sqrt{5}} + \sqrt{45 - 20\sqrt{5}}$$

10. $7 + \sqrt{5}$

11. Find the volume of a frustum formed by cutting a right circular cone of 6 in. radius and 8 in. altitude with a plane parallel to the base and 4 in. above the base.

11. $84\pi \text{ in}^3$

12. Find the length of the altitude to the longest side of a triangle whose sides measure 10, 21, and 17 cm.

12. 8 cm

13. Solve. Express answers in interval notation.

$$2x^3 - 5x^2 - 4x + 3 \geq 0$$

13. $[-1, \frac{1}{2}] \cup [3, \infty)$

14. Simplify the following expression such that no radicals are in the denominator.

$$\frac{\sqrt[3]{4}}{\sqrt[3]{x} - \sqrt[3]{2}}$$

14. $\frac{\sqrt[3]{4x^2} + 2\sqrt[3]{x} + 2\sqrt[3]{2}}{x - 2}$

15. Find the circumference of a circle inscribed in an isosceles trapezoid with bases 8 and 18 cm.

15. 12π