Mathematics 2200
Sample Midterm

Name: _____

FORMULAE

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad cosA = \frac{b^2 + c^2 - a^2}{2bc} \quad a^2 = b^2 + c^2 - 2bc\,cosA \quad \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$
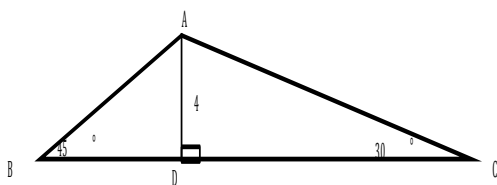
Selected Response:

1. An angle measures $265°$ in standard position. What is the corresponding reference angle?

   (A) $5°$ (B) $15°$ (C) $85°$ (D) $95°$

2. What is the exact value of $\cos(300°)$?

   (A) $-\frac{\sqrt{3}}{2}$ (B) $-\frac{1}{2}$ (C) $\frac{1}{2}$ (D) $\frac{\sqrt{3}}{2}$

3. What is the exact length of BC?

   (A) 6 (B) 12 (C) $4 + 4\sqrt{3}$ (D) $4\sqrt{2} + 4\sqrt{3}$

4. The point $(6, -8)$ lies on the terminal arm of an angle θ in standard position. What is the value of $\sin \theta$?

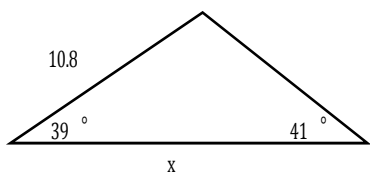   (A) $-\frac{4}{3}$ (B) $-\frac{4}{5}$ (C) $\frac{3}{5}$ (D) $\frac{4}{5}$

5. An angle θ, is plotted in standard position, and its terminal arm lies in quadrant II. Given that $\sin \theta = \frac{21}{29}$, what is $\tan \theta$?

   (A) $-\frac{21}{20}$ (B) $-\frac{20}{29}$ (C) $\frac{20}{29}$ (D) $\frac{21}{20}$

6. Solve: $\cos \theta = -0.6947$, where $0° \leq \theta \leq 360°$

   (A) $\theta = 46°$ and $\theta = 134°$ (B) $\theta = 46°$ and $\theta = 314°$
   (C) $\theta = 134°$ and $\theta = 226°$ (D) $\theta = 226°$ and $\theta = 314°$

7. What is the length of x?

   (A) 7.2 (B) 10.4 (C) 11.3 (D) 16.2

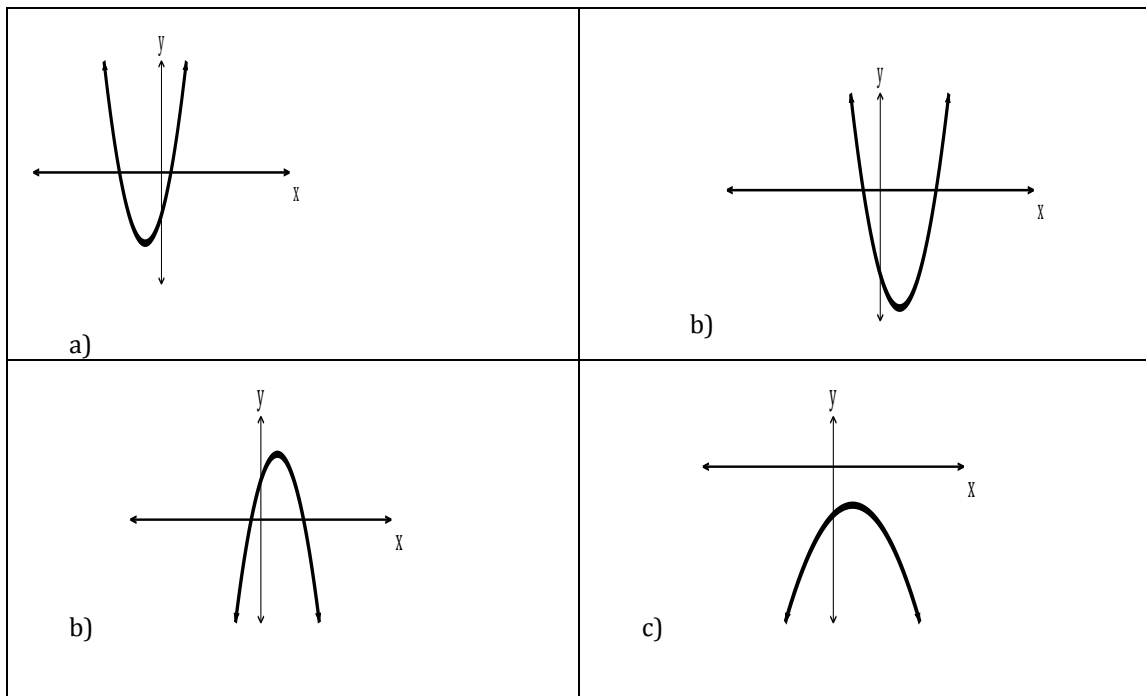8. What is the standard form of the function $y = -3(x + 2)^2 + 4$?

   (A) $-3x^2 - 8$ (B) $-3x^2 - 12x - 48$
   (C) $-3x^2 - 12x - 8$ (D) $-3x^2 - 12x - 12$

9. What is the range of $-3(y - 5) = (x + 2)^2$?

   (A) $\{y \mid y > -5, y \in R\}$ (B) $\{y \mid y \geq -5, y \in R\}$
   (C) $\{y \mid y < 5, y \in R\}$ (D) $\{y \mid y \leq 5, y \in R\}$

8. Which represents the function $y = 2x^2 - 4x - 5$?

a)

b)

b)

c)

11. What is the equation of the axis of symmetry for a parabola given by
$y = -2x^2 + 12x + 5$?

(A) $x = 3$ (B) $x = -3$ (C) $x = -5$ (D) $x = 5$

12. Which represents a parabola with y-intercept -15 and vertex $(1, -5)$?

(A) $f(x) = -20(x - 1)^2 - 5$ (B) $f(x) = -20(x + 1)^2 + 5$
(C) $f(x) = -10(x - 1)^2 - 5$ (D) $f(x) = = 10(x + 1)^2 + 5$

13. If $y = 2x^2 + 12x + 10$ is written in the form $y = a(x - p)^2 + q$, what is the value of q?

(A) -26 (B) -8 (C) 1   (D) 28

14. A rancher plans to use 430 m of fencing to build a cattle enclosure with three equal sections. Which represents the total area of the enclosure in terms of its width, x?

X
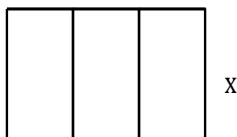
(A) $A = x(215 - 2x)$ (B) $A = x(215 - 2x)$
(C) $A = x(430 - 2x)$ (D) $A = x(430 - x)$

15. What are the x-intercepts of $y = x^2 + 7x - 30$?

(A) $(-15,0),(2,0)$ (B) $(-3,0),(10,0)$ (C) $(-2,0),(15,0)$ (D) $(-10,0),(3,0)$

16. What are the roots of $(2x - 1)(x + 5) = 0$?

(A) $\frac{-1}{2}, -5$ (B) $\frac{1}{2}, -5$ (C) $\frac{1}{2}, 5$ (D) $\frac{-1}{2}, 5$

Theresa's incorrect solution to the equation $4x^2 - 7x - 3 = 0$ is shown. In which step does the **first** error occur?

Step 1 $x = \frac{7 \pm \sqrt{(-7)^2 - (4)(4)(-3)}}{2(4)}$

Step 2 $x = \frac{7 \pm \sqrt{49 - 48}}{8}$

Step 3 $x = \frac{7 \pm \sqrt{1}}{8}$

Step 4 $x = 1, x = \frac{3}{4}$

(A)   1   (B) 2   (C) 3   (D) 4

18. Which describes the quadratic function that has vertex $(-9, 3)$ and passes through the point $(-4, -2)$?

    (A)   The axis of symmetry is $x = -9$ and the discriminant is negative.
    (B)   The axis of symmetry is $x = -9$ and the discriminant is positive.
    (C)   The axis of symmetry is $x = 9$ and the discriminant is negative.
    (D)   The axis of symmetry is $x = 9$ and the discriminant is positive.

19. Solve: $2x(x - 3) + 5(x - 3) = 0$

    (A) $x = -3, \quad x = -\frac{5}{2}$ (B) $x = -3, \quad x = \frac{5}{2}$

    (C) $x = 3, \quad x = -\frac{5}{2}$ (D) $x = 3, \quad x = \frac{5}{2}$

20. Determine a simplified expression for the value of **x**:
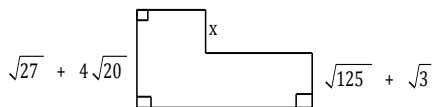
    (A) $2\sqrt{3} + \sqrt{5}$ (B) $2\sqrt{3} + 3\sqrt{5}$ (C) $4\sqrt{3} + \sqrt{5}$ (D) $4\sqrt{3} + 3\sqrt{5}$

21. Write $4x^3y^2\sqrt{5xy}$ as an entire radical.

    (A) $\sqrt{20x^7y^5}$ (B) $\sqrt{20x^{10}y^5}$ (C) $\sqrt{80x^7y^5}$ (D) $\sqrt{80x^{10}y^5}$

22. Simplify completely: $\frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}}$

    (A) $3\sqrt{2} - 2\sqrt{3}$ (B) $3\sqrt{2} + 2\sqrt{3}$ (C) $\frac{3\sqrt{2}-2\sqrt{3}}{5}$ (D) $\frac{3\sqrt{2}+2\sqrt{3}}{5}$

23. Simplify completely: $\frac{\sqrt[3]{2}}{\sqrt[3]{6}}$

    (A) $\frac{\sqrt[3]{3}}{3}$ (B) $\frac{\sqrt[3]{9}}{3}$ (C) $\frac{\sqrt[3]{12}}{6}$ (D) $\frac{\sqrt[3]{72}}{6}$

24. Which is $-2\sqrt[5]{160x^5y^6}$ written in simplest radical form?

    (A) $-4xy\sqrt[5]{5y}$ (B) $-2xy\sqrt[5]{5y}$ (C) $-4xy\sqrt[5]{10y}$ (D) $-2xy\sqrt[5]{10y}$

25. Which is $\dfrac{\sqrt{24}}{3-\sqrt{2}}$ in simplified form?

    (A) $\dfrac{6\sqrt{6}-4\sqrt{3}}{13}$ (B) $\dfrac{6\sqrt{6}-4\sqrt{3}}{11}$ (C) $\dfrac{6\sqrt{6}+4\sqrt{3}}{7}$ (D) $\dfrac{6\sqrt{6}+4\sqrt{3}}{5}$

26. Which represents the product of $\sqrt[3]{4k}\left(\sqrt[3]{12k^2} + 2\sqrt[3]{8}\right)$ in simplest radical form?

    (A) $2k\sqrt[3]{6} + 2\sqrt[3]{4k}$ (B) $2k\sqrt[3]{6} + 4\sqrt[3]{4k}$
    (C) $12k\sqrt[3]{4} + 2\sqrt[3]{4k}$ (D) $k\sqrt[3]{48} + 2\sqrt[3]{32k}$
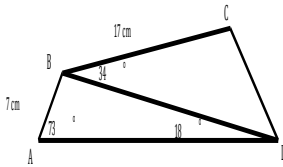
Constructed Response:
Answers to be written on this paper in the space provided. Show all workings.

    1. Solve each of the following trigonometric equations for all possible values   4 marks
        of θ, where $0° \le \theta \le 360°$.

        (A) $\cos \theta = -\frac{\sqrt{2}}{2}$ (B) $\tan \theta = \sqrt{3}$

2. Calculate the length of CD to the nearest tenth of a cm.   4 marks

3. From a height of 2 m, a volleyball is hit into the air. After 1 second, the ball reaches a maximum height of 7 m. Write the quadratic function, in the form $y = a(x - p)^2 + q$, that models the situation and use it to determine the height of the ball at 1.5 seconds.   3 marks

Function_____

Height_____

4. A rectangular lot is bounded on one side by a river and on the other three sides by a total of 100 m of fencing.

(A) Algebraically determine the quadratic function that models the area.   2 marks

(B) What are the dimensions of the largest possible lot and the maximum area?   3 marks
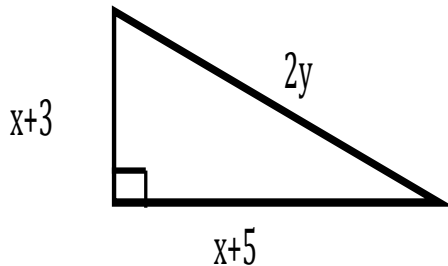
5. Algebraically determine the **exact** roots, in simplest form: 4 marks

$16(x^2 - 1) = 24(2x + 1)$

6. The right triangle shown has a perimeter of 24 cm and an area of $(2y + 14)\ cm^2$. Algebraically determine the value(s) of x and y.   4 marks

7. Simplify each of the following.

(A) $(5\sqrt{2x} + \sqrt{5})(-4\sqrt{2x} + \sqrt{5x})$ 3 marks

(B) $-3\sqrt{7r^3} \cdot 6\sqrt{7r^2}$ 3 marks

8. Algebraically solve the following equation for x.   4 marks

$\sqrt{x - 1} = x - 7$