

MATH 114
05. 18. 2007

Name:

FINAL EXAM

Please circle the name of your TA:

Nathan Panike

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Show all your work in order to receive credit. A correct answer without any work will receive 0 credit. Partial credit will be given ONLY for results that are correct and relevant to the problem. Please write your answers neatly. Good luck!

P1	
P2	
P3	
P4	
P5	
Multiple choice	
TOTAL	

1. (10 points) The polynomial $f(X) = X^6 - X^4 - 10X^3 - 26X^2 - 40X - 24$ has zeros $x = 2i$ and $x = 3$. Find all zeros of f .

$x =$ _____

2. (10 points) A sample of 210 lead decays to polonium 210 according to the formula

$$A(t) = 800(2)^{-\frac{t}{3}}$$

where t is in days and $A(t)$ is in grams.

a) What is the initial amount of lead 210?

b) How many grams are there after 12 days?

c) How long will the sample take to decay to 25% of its initial amount.

3. a) (5 points) Solve the following logarithmic equation

$$\log_2 \sqrt[4]{4x+2} = \log_2 \sqrt{x} + 1$$

- b) (5 points) Find the solutions of the following equation that are in the interval $[0, 2\pi)$

$$\cos 5t \sin 2t = \sin 5t \cos 2t$$

4. (10 points) A hill slopes at an angle of 30° with the horizontal. A 400 feet tall tower is installed on top of the hill. From the base of the hill the angle of elevation of the top of the tower is 75° . How much rope would be required to reach from the top of the tower to the bottom of the hill? (Rationalize the denominator in your answer).

5. (10 points) Let $\vec{v} = \langle 5, -5 \rangle$ and $\vec{w} = \langle -2, 2 \rangle$. Determine the following:

a) $2\vec{v} - 5\vec{w}$

b) $\|\vec{v}\|$ and $\|\vec{w}\|$

c) $\vec{v} \cdot \vec{w}$

d) the angle between \vec{v} and \vec{w}

e) the unit vector in the direction of \vec{v}

For each of the following questions circle **only one** answer. If you circle more than one answer you are not getting any credit, even if the right one was among your choices. There are 10 questions each question is worth 3 points.

6. Find the equation of the line that passes through $(1, 3)$ and is perpendicular to the line $2x + 3y + 5 = 0$

A. $3x - 2y + 3 = 0$ B. $2x + 3y - 11 = 0$
C. $2x + 3y - 9 = 0$ D. $3x - 2y - 7 = 0$ E. none of these

7. Given $f(x) = \frac{1}{x^2}$ and $g(x) = \sqrt{x^2 + 4}$ find $(f \circ g)(x)$.

A. $\frac{1}{\sqrt{x^2 + 4}}$ B. $\frac{1}{x^2\sqrt{x^2 + 4}}$ C. $\frac{\sqrt{x^2 + 4}}{x^2}$ D. $\frac{1}{x^2 + 4}$ E. none of these

8. Find the equation of an ellipse with major axis of length 6 and foci at $(0, \pm 2)$

A. $\frac{x^2}{9} + \frac{y^2}{5} = 1$ B. $\frac{x^2}{\sqrt{5}} + \frac{y^2}{3} = 1$
C. $\frac{x^2}{5} + \frac{y^2}{4} = 1$ D. $\frac{x^2}{5} + \frac{y^2}{9} = 1$ E. none of these

9. Find the vertical asymptotes of $f(x) = \frac{2x + 4}{x^2 - x - 6}$

A. $x = 6, -1$ B. $x = -1, 6$ C. $x = 3$ only D. $x = -2, 3$ E. none of these

10. Evaluate $\sec(\arctan 3)$

A. $\frac{1}{\sqrt{10}}$ B. $\sqrt{10}$ C. $\frac{\sqrt{10}}{3}$ D. $2\sqrt{2}$ E. none of these

11. Which sequence of transformations will yield the graph of $g(x) = -|x + 9|$ from the graph of $f(x) = |x|$?

- A. reflection about the x -axis and horizontal shift 9 units to the left B. reflection about the y -axis and horizontal shift 9 units to the left
C. reflection about the x -axis and horizontal shift 9 units to the right D. reflection about the y -axis and horizontal shift 9 units to the right
E. none of these
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12. Determine the period of the function $f(x) = \tan\left(\frac{x}{2}\right)$

- A. π B. 2π C. $\frac{\pi}{2}$ D. 4π E. none of these
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13. Evaluate $[3(-\sqrt{2} - \sqrt{2}i)]^3$

- A. $-54\sqrt{2} - 54\sqrt{2}i$ B. $\frac{216\sqrt{3}}{3} + 216i$
C. $108\sqrt{2} - 108\sqrt{2}i$ D. $-108\sqrt{2} - 108\sqrt{2}i$ E. none of these
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14. Solve the inequality $-x^2 + 6x - 9 < 0$

- A. $(-\infty, 3) \cup (3, \infty)$ B. $(-\infty, \infty)$ C. $\{3\}$ D. no solutions E. none of these
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15. The function $f(x) = x^2 - 6x + 4$ has a maximum value equal to:

- A. 3 B. -3 C. -5 D. 5 E. none of these
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