

Math 1523 Exam 3 (Sample) name: _____

Instructor: _____ Section: _____

Part One. Place your answers on the scantron. Use Special Codes to identify your section. Also, darken in your name and ID #.

1) Which vector has the same magnitude, $||\mathbf{u}||$, as $\mathbf{u} = 60\mathbf{i} + 25\mathbf{j}$?

A) $59\mathbf{i} + 11\mathbf{j}$ B) $33\mathbf{i} + 56\mathbf{j}$ C) $28\mathbf{i} + 45\mathbf{j}$ D) $50\mathbf{i} + 39\mathbf{j}$ E) $55\mathbf{i} + 48\mathbf{j}$

2) Convert $x - 2y = 11$ to a polar equation.

A) $r = 11(\cos\theta - 2\sin\theta)$ B) $r = 11(\sin\theta - 2\cos\theta)$ C) $r = \frac{11}{\cos\theta - 2\sin\theta}$
D) $r = \frac{11}{\sin\theta - 2\cos\theta}$ E) $r = \frac{\cos\theta - 2\sin\theta}{11}$

3) Which of the following ellipses has a focus at $(0, 24)$?

A) $\frac{x^2}{225} + \frac{y^2}{625} = 1$ B) $\frac{x^2}{625} + \frac{y^2}{49} = 1$ C) $\frac{x^2}{49} + \frac{y^2}{576} = 1$
D) $\frac{x^2}{49} + \frac{y^2}{625} = 1$ E) $\frac{x^2}{625} + \frac{y^2}{225} = 1$

4) Given: $\|u\| = 18$ and $\|v\| = 26$ and the direction angle of u is equal to 120° and the direction angle of v is equal to 35° , then what is the dot product of u and v ?

- A) 424 B) 42.8 C) -82.4 D) 78 E) 40.8

5) What type of conic is the graph of: $4y^2 - 8x + 15y - 11 = 0$?

- A) ellipse B) circle C) parabola D) hyperbola E) triangle

6) Change the complex number $-4 - 4\sqrt{3}i$ to trigonometric form.

- A) $8 \left(\cos \frac{7\pi}{6} + i \sin \frac{7\pi}{6} \right)$ B) $8 \left(\cos \frac{4\pi}{3} + i \sin \frac{4\pi}{3} \right)$
C) $8 \left(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3} \right)$ D) $16 \left(\cos \frac{4\pi}{3} + i \sin \frac{4\pi}{3} \right)$
E) None of these

7) Which of the following polar points lies in the second quadrant?

- A) $(-6, 250^\circ)$ B) $(6, -280^\circ)$ C) $(-6, -250^\circ)$
D) $(-6, -50^\circ)$ E) $(6, 190^\circ)$

8) What is the angle between the vectors $\mathbf{u} = 15\mathbf{i} - 8\mathbf{j}$ and $\mathbf{v} = -8\mathbf{i} - 6\mathbf{j}$?

- A) 115° B) 65° C) 119° D) 135° E) 92°

9) Which of the following is a focus of the hyperbola: $\frac{(y-9)^2}{225} - \frac{(x+2)^2}{64} = 1$

- A) $(\sqrt{161} - 2, 9)$ B) $(-2, 9 + \sqrt{161})$ C) $(15, 9)$ D) $(-2, 26)$ E) $(8, -2)$

10) If $\mathbf{u} = -12\mathbf{i} + 5\mathbf{j}$ and $\mathbf{v} = 4\mathbf{i} + 3\mathbf{j}$, then find $(2\mathbf{u}) - (-3\mathbf{v})$,

the difference of $2\mathbf{u}$ and $-3\mathbf{v}$.

- A) $-36\mathbf{i} + 19\mathbf{j}$ B) $-12\mathbf{i} + \mathbf{j}$ C) $19\mathbf{j}$ D) $-36\mathbf{i} + \mathbf{j}$ E) $-12\mathbf{i} + 19\mathbf{j}$

11) Which of the following is an asymptote of the hyperbola: $\frac{x^2}{64} - \frac{y^2}{144} = 1$?

- A) $y = \frac{9}{4}x$ B) $y = \frac{4}{9}x$ C) $y = \frac{3}{2}x$ D) $y = \frac{2}{3}x$ E) $y = \frac{\sqrt{13}}{2}x$

12) Which point is on the graph of $r = 6 - 6 \sin \theta$?

- A) $(12, 0)$ B) $(12, \frac{3\pi}{2})$ C) $(6, \frac{\pi}{2})$ D) $(9, \frac{5\pi}{6})$ E) $(12, \pi)$

13) Which parabola has a focus at $(0, -6)$?

- A) $y^2 = 24x$ B) $x^2 = 24y$ C) $y^2 = -24x$ D) $x^2 = -24y$ E) $x^2 = -6y$

14) Which of the following is equivalent to $-9\sqrt{2} \left(\cos \frac{7\pi}{4} + i \sin \frac{7\pi}{4} \right)$?

- A) $-9 - 9i$ B) $-9 + 9i$ C) $9 - 9i$ D) $9 + 9i$ E) $-\frac{9}{2} - \frac{9}{2}i$

15) Which of the following is a true statement when converting polar coordinates to rectangular or converting rectangular coordinates to polar?

- A) $r = x + y$ B) $x = r \sin \theta$ C) $x + y = r \cos \theta + \sin \theta$
D) $\frac{y}{r} = \sin \theta$ E) $(x + y)^2 = r^2$

16) Which parabola has a vertex at $(3, 1)$ and a directrix at $y = 7$?

- A) $(x - 3)^2 = 24(y - 1)$ B) $(x - 3)^2 = -24(y - 1)$
C) $(y - 1)^2 = 24(x - 3)$ D) $(y - 1)^2 = -24(x - 3)$
E) None of these

17) What is the direction angle of the vector $u = -i + \sqrt{3}j$?

- A) 30° B) 60° C) -60° D) 120° E) 150°

18) If $k > 0$ and the vertex of a parabola is at the origin and

its focus is at the point $(0, -k)$, then the equation is:

- A) $y^2 = 4kx$ B) $y^2 = -4kx$ C) $x^2 = 4ky$ D) $x^2 = -4ky$

19) If $u = -2i - 5j$ and $v = 8i - 3j$, then what is the dot product of

the two vectors $6u$ and $-7v$?

- A) 42 B) -77 C) 612 D) 723 E) 0

20) Which of the following is a unit vector that is orthogonal to

the vector $u = 24i - 32j$?

- A) $\frac{3}{5}i - \frac{4}{5}j$ B) $\frac{3}{5}i + \frac{4}{5}j$ C) $\frac{5}{13}i + \frac{12}{13}j$
D) $\frac{4}{5}i + \frac{3}{5}j$ E) $-\frac{8}{17}i + \frac{15}{17}j$

21) Which vector has a terminal point at $(7, -8)$ and an initial point at $(-3, -5)$?

- A) $\langle -10, 3 \rangle$ B) $\langle 10, 3 \rangle$ C) $\langle 10, -3 \rangle$ D) $\langle -10, -3 \rangle$

22) What is the center of the ellipse with equation:

$$2x^2 + 3y^2 + 8x - 24y + 50 = 0 ?$$

- A) $(-4, 12)$ B) $(4, -12)$ C) $(2, -4)$ D) $(-2, 4)$ E) $(0, 0)$

23) Which of the following vector is a unit vector?

- a) $\langle 1, 1 \rangle$ b) $\langle \frac{1}{2}, \frac{1}{2} \rangle$ c) $\langle \frac{\sqrt{3}}{2}, \frac{1}{2} \rangle$ d) $\langle \frac{3}{4}, \frac{4}{5} \rangle$ e) $\langle 0, \frac{1}{2} \rangle$

24) Convert the polar point $(-6, \frac{5\pi}{6})$ to a rectangular point.

- A) $(3\sqrt{3}, 3)$ B) $(-3\sqrt{3}, 3)$ C) $(3\sqrt{3}, -3)$ D) $(3, -3\sqrt{3})$

25) What is the norm $[|| u ||]$ of the vector $u = \langle \frac{112}{53}, \frac{180}{53} \rangle$?

- A) 1 B) 2 C) 4 D) 16 E) 256

Part Two. Show your work and place your answer in the box provided.

- 1) Find a vector that has the same direction angle as $\mathbf{u} = 30\mathbf{i} - 16\mathbf{j}$ but has a magnitude (or length) of 29.
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- 2) Find the center of the following hyperbola:

$$5x^2 - 7y^2 - 20x + 42y - 78 = 0$$

- 3) Change the polar equation $r = 4 \cos \theta$ to rectangular form and solve for either y or y^2 .
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- 4) Find each focus for the ellipse: $\frac{(x + 19)^2}{1369} + \frac{(y - 27)^2}{144} = 1$
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- 5) If $\mathbf{u} = -15\mathbf{i} + (2k - 1)\mathbf{j}$ and $\mathbf{v} = (3 - k)\mathbf{i} - 8\mathbf{j}$ are orthogonal (or perpendicular) vectors , then find the value of k .
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- 6) Find the directrix and focus of the parabola: $(y + 4)^2 = 60(x - 1)$
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- 7) Given the hyperbola: $\frac{y^2}{49} - \frac{x^2}{576} = 1$, find:
each vertex , each focus and each asymptote .
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- 8) Change $y^2 = 4x$ to a polar equation and solve for r .