

Part 1: Multiple Choice - Clearly circle your final answer for each question. Work will not be graded on this portion, only answers circled (30 pts). Be aware of your calculator mode!

Find the indicated part of the following NON-RIGHT triangles

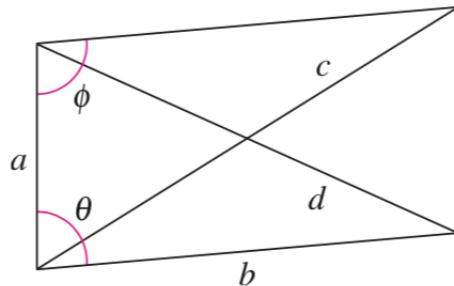
1. $a=62$ $c=43$ $B=53^\circ$ $b=?$

- A. 2484.1 B. 37.9 C. 49.8 D. 63.9 E. None of the above

2. $B=43^\circ$ $C=27^\circ$ $a=34$ $b=?$

- A. 51.1 B. 24.7 C. 25.6 D. 46.8 E. None of the above

3. In the figure below $a=7$, $c=18$, and $d=10$. Use this information to solve the parallelogram for b . The diagonals of the parallelogram are represented by c and d . Round answers to two decimal places.



- A. 12.77 B. 6.03 C. 11.08 D. 9.82 E. 9.40

4. Find the magnitude and direction angle of $v = 3i + 3j$. Round direction angle to nearest degree.

A. $\|v\| = 3\sqrt{2}, \theta = 37^\circ$

B. $\|v\| = \sqrt{6}, \theta = 40^\circ$

C. $\|v\| = \sqrt{6}, \theta = 45^\circ$

D. $\|v\| = 3\sqrt{2}, \theta = 55^\circ$

E. $\|v\| = 3\sqrt{2}, \theta = 45^\circ$

For problems 5 & 6, use the following vectors: $u = \langle -1, 2 \rangle$ and $v = \langle 3, -3 \rangle$

5. Find $3u \cdot v$

A. -27

B. -9

C. -24

D. 3

E. -15

6. Find $(u \cdot -2v)u$

A. -18

B. 18

C. $\langle -18, 36 \rangle$

D. $\langle 18, -36 \rangle$

E. -36

Determine the solution set of the following system of equations (you may use any method):

$$x + z = 9$$

7. $3x + 2y - z = -15$

$$5x + 3y = -7$$

A. $(5, -5, 4)$ B. $(4, -4, 5)$ C. $(-2, 1, 11)$ D. $(6, -2, -3)$ E. None of the above

Determine the solution set of the following system of equations (you may use any method):

8.
$$\begin{aligned} 2x - y &= 0 \\ 4x + y &= 3 \end{aligned}$$

- A. $\left(\frac{1}{2}, 1\right)$ B. $(2, 4)$ C. $\left(-\frac{1}{2}, -1\right)$ D. $\left(1, \frac{1}{2}\right)$ E. $\left(-1, \frac{1}{2}\right)$

Fill in the blanks using elementary row operations to form a row-equivalent matrix.

Original Matrix	New Row-Equivalent Matrix
9. $\begin{bmatrix} 3 & 6 & 8 \\ 4 & -3 & 6 \end{bmatrix}$	$\begin{bmatrix} 1 & ? & 8/3 \\ 4 & -3 & 6 \end{bmatrix}$

- A. 18 B. 2 C. 12 D. 4 E. None of the above

10. Identify the next elementary row operation to be performed to solve the system by Gauss-Jordan Elimination. The first step has been done for you.

$$\begin{bmatrix} 1 & 3 & 1 \\ 3 & 7 & 5 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 3 & 1 \\ & & \end{bmatrix}$$

- A. $-3R_1 + R_2$ B. $3R_2 + R_1$ C. $-3R_2 + R_1$ D. $3R_1 + R_2$ E. None of the above

11. If $A = \begin{bmatrix} 1 & -1 \\ 2 & 4 \end{bmatrix}$, for which matrix X is $AX \neq XA$?

A. $X = \begin{bmatrix} 1 & -1 \\ 2 & 4 \end{bmatrix}$

B. $X = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

C. $X = \begin{bmatrix} \frac{2}{3} & \frac{1}{6} \\ -\frac{1}{3} & \frac{1}{6} \end{bmatrix}$

D. $X = \begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$

E. None of the above

12. Of the products AB, BA, A^2 , and B^2 , which ones are possible for the given matrices?

$$A = \begin{bmatrix} 7 \\ 5 \\ -8 \end{bmatrix}, B = \begin{bmatrix} 9 & -3 & -8 \end{bmatrix}$$

A. A^2 only B. BA only C. B^2 only D. AB and BA only E. AB only

13. Write the first 5 terms of the sequence, starting with term 1:

$$a_n = (n-1)!$$

A. 1, 1, 2, 6, 24

B. 0, 1, 2, 6, 24

C. 1, 2, 6, 24, 120

D. 0, 0, 1, 5, 23

E. None of the above

14. Write the first 5 terms of the arithmetic sequence:

$$a_2 = 13 \quad a_8 = 31$$

- A. 9, 13, 17, 21, 25 B. 7, 13, 19, 25, 31
C. 13, 16, 19, 22, 25 D. 10, 13, 16, 19, 22 E. None of the above

15. Write the first 5 terms of the geometric sequence:

$$a_2 = 4 \quad a_3 = 12$$

- A. $\frac{4}{3}$, 4, 12, 36, 108 B. $\frac{3}{4}$, 4, 12, 36, 108
C. -4, 4, 12, 20, 28 D. 4, 12, 20, 28, 36 E. None of the above

16. Find the sum of the arithmetic sequence:

$$\sum_{j=1}^{10} (3j - 1)$$

- A. 155 B. 165 C. 145 D. 310 E. None of the above

17. Find the 4th term of $(4x + 5y)^6$ (Write the expansion in descending powers of x.)

- A. $300x^2y^4$ B. $15625y^6$ C. $160,000x^3y^3$ D. $150,000x^2y^4$ E. $400x^3y^3$

18. Find the number of distinguishable permutations of the letters in:

CORRECT

A. 5040

B. 1260

C. 630

D. 7

E. 2520

19. Find the coordinates of the foci of: $\frac{(x+2)^2}{9} + \frac{(y-3)^2}{16} = 1$

A. $(-2, 8)$ & $(-2, -2)$ B. $(5, 3)$ & $(-7, 3)$

C. $(-2 \pm \sqrt{7}, 3)$ D. $(-2, 3 \pm \sqrt{7})$ E. None of the above

20. Find the center, vertices, and foci of: $5x^2 - 6y^2 = 30$

Center: $(0, 0)$

A. Vertices: $(\pm 6, 0)$

Foci: $(\pm\sqrt{11}, 0)$

Center: $(0, 0)$

B. Vertices: $(0, \pm 5)$

Foci: $(\pm\sqrt{11}, 0)$

Center: $(0, 0)$

C. Vertices: $(0, \pm\sqrt{6})$

Foci: $(0, \pm\sqrt{11})$

Center: $(0, 0)$

D. Vertices: $(\pm\sqrt{6}, 0)$

Foci: $(0, \pm\sqrt{11})$

Center: $(0, 0)$

E. Vertices: $(\pm\sqrt{6}, 0)$

Foci: $(\pm\sqrt{11}, 0)$

21. Change from polar to rectangular form: $r = 5 \sin \theta$

- A. $x = 5$ B. $y = 5$ C. $x^2 + y^2 - 5y = 0$ D. $x^2 + y^2 - 5x = 0$ E. None of the above

22. Change from polar to rectangular form: $\theta = \frac{\pi}{6}$

- A. $y = \sqrt{2}x$ B. $y = x$ C. $y = \sqrt{3}x$ D. $y = \frac{\sqrt{3}}{3}x$ E. $y = \frac{\sqrt{2}}{2}x$

23. Change from rectangular to polar form:

$$y = 5$$

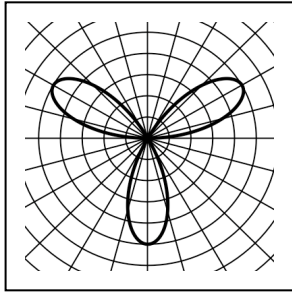
- A. $r = 5 \csc \theta$ B. $r \cos \theta = 5$ C. $\cos \theta = 5$ D. $\sin \theta = 5$ E. None of the above

24. Change from rectangular to polar form:

$$(0, 2)$$

- A. $\left(0, \frac{\pi}{2}\right)$ B. $\left(-2, \frac{\pi}{2}\right)$ C. $\left(2, \frac{\pi}{2}\right)$ D. $\left(2, -\frac{\pi}{2}\right)$ E. None of the above

25. Choose a polar equation that would produce the given graph:



A. $r = 3 \sin 5\theta$

B. $r = 5 \cos 3\theta$

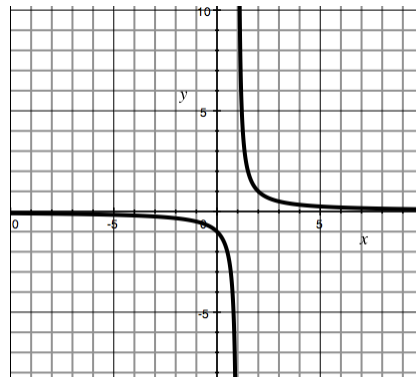
C. $r = 5 \sin 3\theta$

D. $r = -5 \sin 3\theta$

E. None of the above

26. Using the graph of the function, determine if the limit exists:

$$\lim_{x \rightarrow 1} \frac{1}{x-1}$$



A. Yes

B. No

27. Find the limit of the function algebraically:

$$\lim_{x \rightarrow -1} \sqrt{x+2}$$

A. 1

B. -1

C. 2

D. $\sqrt{3}$

E. None of the above

28. Find the limit of the function algebraically:

$$\lim_{x \rightarrow -2} \frac{x^2 + 8x + 12}{x^2 - 3x - 10}$$

- A. 0 B. $-\frac{4}{7}$ C. $\frac{8}{7}$ D. -1 E. None of the above

29. Find any horizontal asymptotes of the function: $f(x) = \left[\frac{x}{(x+1)^2} - 4 \right]$

- A. No HA B. $y = -3$ C. $y = -4$ D. $y = 0$ E. $y = 4$

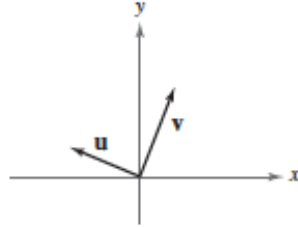
30. Rewrite the sum as a rational function in simplest form:

$$\sum_{i=1}^n \frac{i+2}{n^2}$$

- A. $\frac{n^2 + n + 4}{2n^2}$ B. $\frac{n+3}{2n}$ C. $\frac{n+5}{2n}$ D. $\frac{n^2 + 5n + 6}{2n^2}$ E. None of the above

Part 2: Free Response All work and notation will be graded on this portion. (30 pts.)

1. Use the figure to graph the specified vector: $u+2v$



2. Solve the system (show all work):
- $$\begin{aligned} x &= y + 3 \\ x &= y^2 + 1 \end{aligned}$$

3. Find the determinant of the matrix. Expand by cofactors on the row or column that appears to make the computations easiest. (Show all work)

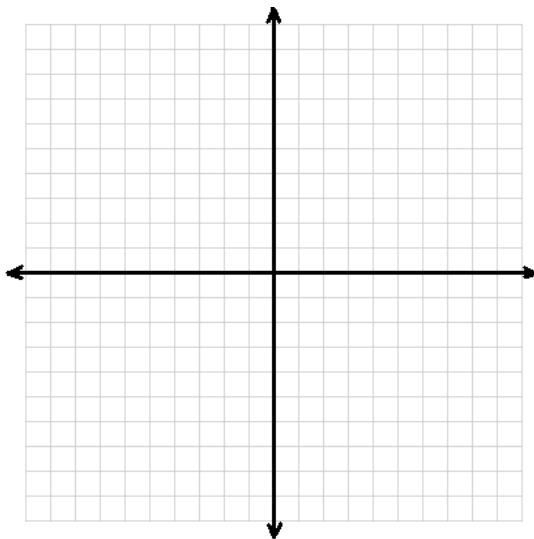
$$\begin{bmatrix} 2 & -2 & 3 & 3 \\ 1 & 1 & -2 & 4 \\ -1 & 2 & 0 & 0 \\ 3 & 5 & 2 & 4 \end{bmatrix}$$

4. Write the partial fraction decomposition for the rational expression (show all work!)

$$\frac{4x^2 + 2x - 1}{x^2(x+1)}$$

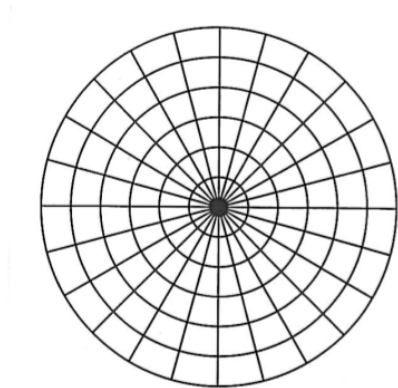
5. The first term of a geometric sequence is 3 and the 8th term is 384. What is the sum of the first 8 terms of the sequence?

6. Find the standard equation and graph the following: $y^2 - 4y - 4x = 0$

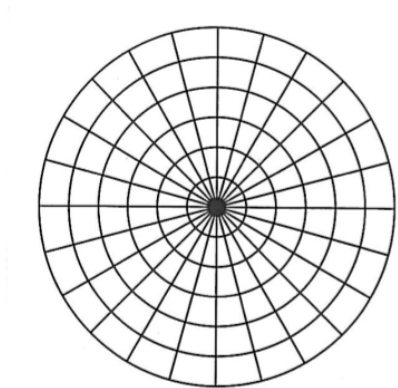


Identify the specific type and sketch the graph (showing all work):

7. $r = 5 \sin 2\theta$



8. $r = 2 - 4 \sin \theta$



9. Find the derivative of the function using the limit process $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

(Show all work)

$$g(x) = 2x^2 + 4x - 1$$