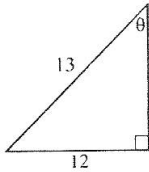
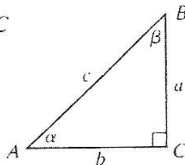


P-5 Midterm Exam B (continued)

27. Evaluate all six trigonometric functions of the angle θ for the triangle given below.



28. Solve the right triangle $\triangle ABC$ for all its unknown parts if $\alpha = 43^\circ$ and $a = 3.5$.



29. Which transformation was *not* performed on $y = \cos x$ to obtain $y = -4 \cos(2x + \pi/3)$?

- A. Vertical stretch by a factor of 4
- B. Horizontal stretch by a factor of 2
- C. Horizontal shift left by $\pi/6$ units
- D. Reflection through the x -axis.

30. At the top a radio signal tower there is an antenna with a light on the end of it. From a point on the ground 800 feet from the base of the tower, the angle of elevation to the tip of the light is 48.8° and the angle of elevation to the bottom of the antenna is 42.7° . What is the height of the antenna, including the light?

31. Simplify: $(\sec x - \csc x) \sin x \cos x =$

- A. $\sin x - \cos x$
- B. $\cos x - \sin x$
- C. $\sin x + \cos x$
- D. $\cos x + \sin x$

32. For the next 15 years, a small company's business volume can be modeled by the function $f(x) = 47(1.09)^x + 3 \sin \frac{\pi x}{6}$, where x is the number of years after 2006 and f is the sales in millions of dollars.

- (a) What are the company's sales in 2006?
- (b) What does the model project for sales in 2013?
- (c) How many years are in each economic cycle for this company?

$$\begin{aligned} 27. \sin \theta &= \frac{12}{13} \\ \tan \theta &= \frac{12}{5} \\ \csc \theta &= \frac{13}{12} \\ \cos \theta &= \frac{5}{13} \\ \sec \theta &= \frac{13}{5} \\ \cot \theta &= \frac{5}{12} \end{aligned}$$

$$\begin{aligned} 28. \beta &= 47^\circ \\ b &= 3.75 \\ c &= 5.13 \end{aligned}$$

29. B

30. 175.6 ft

31. A

32. (a) 47
 (b) 86
 (c) ~~_____~~

6-10 Final Exam A

1. Solve the system graphically.

Round the answer to the nearest hundredth.

$$\frac{x^2}{2} + \frac{y^2}{5} = 1$$

$$y = \frac{1}{3}x$$

1. $(1.38, .46)$
 $(-1.38, -.46)$

2. Solve the system by any method.

$$3x + 4y - 6z = 4$$

$$x + 2y = 8$$

$$5x + 2z = 4$$

2. $(0, 4, 2)$

3. Which of the following is the matrix equation that represents the system of linear equations below?

$$3x + 6y = -2$$

$$2x - 4y = 10$$

A. $\begin{bmatrix} 3 & 2 \\ 6 & -4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -2 \\ 10 \end{bmatrix}$

B. $\begin{bmatrix} 3 & 6 \\ 2 & -4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 10 \\ -2 \end{bmatrix}$

C. $\begin{bmatrix} 3 & 6 \\ 2 & -4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -2 \\ 10 \end{bmatrix}$

D. $\begin{bmatrix} -\frac{1}{4} & -\frac{1}{2} \\ -\frac{1}{6} & \frac{1}{3} \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -2 \\ 10 \end{bmatrix}$

E. $\begin{bmatrix} -\frac{1}{6} & \frac{1}{3} \\ -\frac{1}{4} & -\frac{1}{2} \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -2 \\ 10 \end{bmatrix}$

3. C

4. By augmented matrix, solve the following system:

$$x - y - z = 3$$

$$3x + 4y + 5z = 1$$

$$y + 2z = -2$$

4. $(2, 0, -1)$

6-10 Final Exam A (continued)

5. The matrix $\begin{bmatrix} 1 & 1 & -1 \\ -3 & 2 & -1 \\ 3 & -3 & 2 \end{bmatrix}$ is the inverse of

5. $(5, -8, 7)$

$\begin{bmatrix} 1 & 1 & 1 \\ 3 & 5 & 4 \\ 3 & 6 & 5 \end{bmatrix}$. Solve the following system by the inverse

matrix method.

$$x + y + z = 4$$

$$3x + 5y + 4z = 3$$

$$3x + 6y + 5z = 2$$

6. Sketch the region of feasible points and solve the linear programming problem.

Maximize $C = 4x - 5y$, subject to:

$$x \geq 2$$

$$y \geq 0$$

$$x + y \leq 7$$

$$x + 2y \geq 8$$

$(0, 7)$ $(7, 0)$
 $(0, 4)$ $(8, 0)$

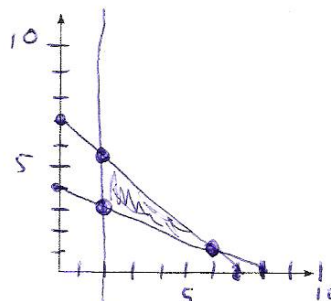
$(2, 5) \rightarrow -13$

$(2, 3) \rightarrow -7$

$(6, 1) \rightarrow 19$

6. $C = \frac{19}{(6, 1)}$

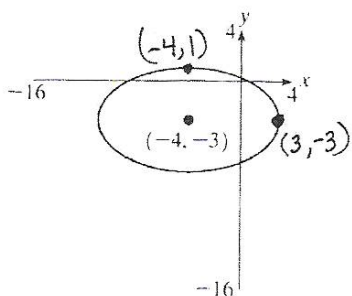
at $(6, 1)$



7. $(4, 0)$

7. What is the focus of the graph of $y^2 = 16x$?

8. Write the equation of the ellipse graphed below.



8. $\left(\frac{(x+4)^2}{49}\right) + \frac{(y+3)^2}{16} = 1$

In Problems 7–8, use Gaussian elimination to solve the system.

$$\begin{aligned} 7. \quad & 3x + 2y - z = -2 \\ & x + 2y - 3z = -10 \\ & 2x - y + z = 12 \end{aligned}$$

$$7. \quad \underline{(3, -5, 1)}$$

$$\begin{aligned} 8. \quad & x + y + 4z = 2 \\ & 2x + 3y - z = 17 \\ & 4x + 5y + 7z = 21 \end{aligned}$$

$$8. \quad \underline{(-13z - 11, 9z + 13, z)}$$

12. The graph of the polar equation $r = \frac{4}{3 - 4 \sin \theta}$ is a(n)

- A. circle.
- B. ellipse.
- C. hyperbola.
- D. parabola opening up or down.
- E. parabola opening right or left.

12. C

13. An airplane is flying on a bearing 75° east of north at 600 mph. Express the velocity of the airplane as a vector.

$$13. \quad \underline{\langle 579.6, 155.3 \rangle}$$

15. Determine whether the vectors $(2, -1)$ and $(-3, -7)$ are orthogonal.

15. Skip (Not orthogonal)

16. Find the angle between vector $\mathbf{u} = \langle 5, -2 \rangle$ and vector $\mathbf{v} = \langle 1, -3 \rangle$.

$$16. \quad \underline{\theta = 49.8} \quad \cos \theta = \frac{11}{\sqrt{29} \cdot \sqrt{10}}$$

17. Eliminate the parameter and identify the graph of the parametric curve given by $x = \frac{3}{2t + 3}, y = 2t + 2$.

$$17. \quad \underline{x = \frac{3}{y+1} \text{ or } y = \frac{3}{x} - 1}$$

Find the inverse matrix of $\begin{bmatrix} 2 & 3 \\ 6 & 4 \end{bmatrix}$. Then show how to use matrix multiplication to support your result.

$$\frac{1}{-10} \begin{bmatrix} 4 & -3 \\ -6 & 2 \end{bmatrix} = \begin{bmatrix} -.4 & .3 \\ .6 & -.2 \end{bmatrix}$$

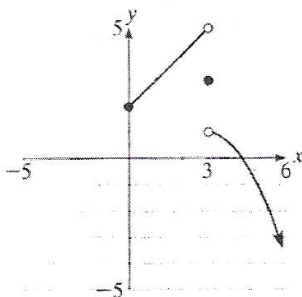
6-10 Final Exam B (continued)

26. Find the partial fraction decomposition of $\frac{2-3x}{x^2}$.

26. $\frac{-3}{x} + \frac{2}{x^2}$

27. For the function $f(x)$ graphed below, which of the following is the $\lim_{x \rightarrow 3} f(x)$?

27. D



- A. $\lim_{x \rightarrow 3} f(x) = 2$ B. $\lim_{x \rightarrow 3} f(x) = 1/2$
 C. $\lim_{x \rightarrow 3} f(x) = 1$ D. $\lim_{x \rightarrow 3} f(x)$ does not exist

28. Find the average rate of change of $f(x) = \sin x$ over the interval $[0, \pi/2]$.

28. $\frac{1}{\pi/2} = \frac{2}{\pi} \approx .64$

29. For the function $f(x) = \frac{-2}{x}$, what is the equation of the tangent line at $x = 2$?

$(0, 0)$
 $(\frac{\pi}{2}, 1)$

29. $y + 1 = \frac{1}{2}(x - 2)$ $y = \frac{1}{2}x - 2$

10. Write an augmented matrix for the system of equations. Then use elementary row operations to obtain the row echelon form.

10. _____

$-x + 2y - 7z = -10$
 $2x + y + 3z = 19$
 $3x + 4y - z = 7$

$$\begin{bmatrix} 1 & -2 & -7 & -10 \\ 0 & 1 & -2.2 & -1.2 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

57. Find the expanded form $(3x - y)^5$

$$1(3x)^5(-y)^0 + 5(3x)^4(-y)^1 + 10(3x)^3(-y)^2 + 10(3x)^2(-y)^3 + 5(3x)^1(-y)^4 + (3x)^0(-y)^5$$

$$243x^5 - 405x^4y + 270x^3y^2 - 90x^2y^3 + 15xy^4 - y^5$$