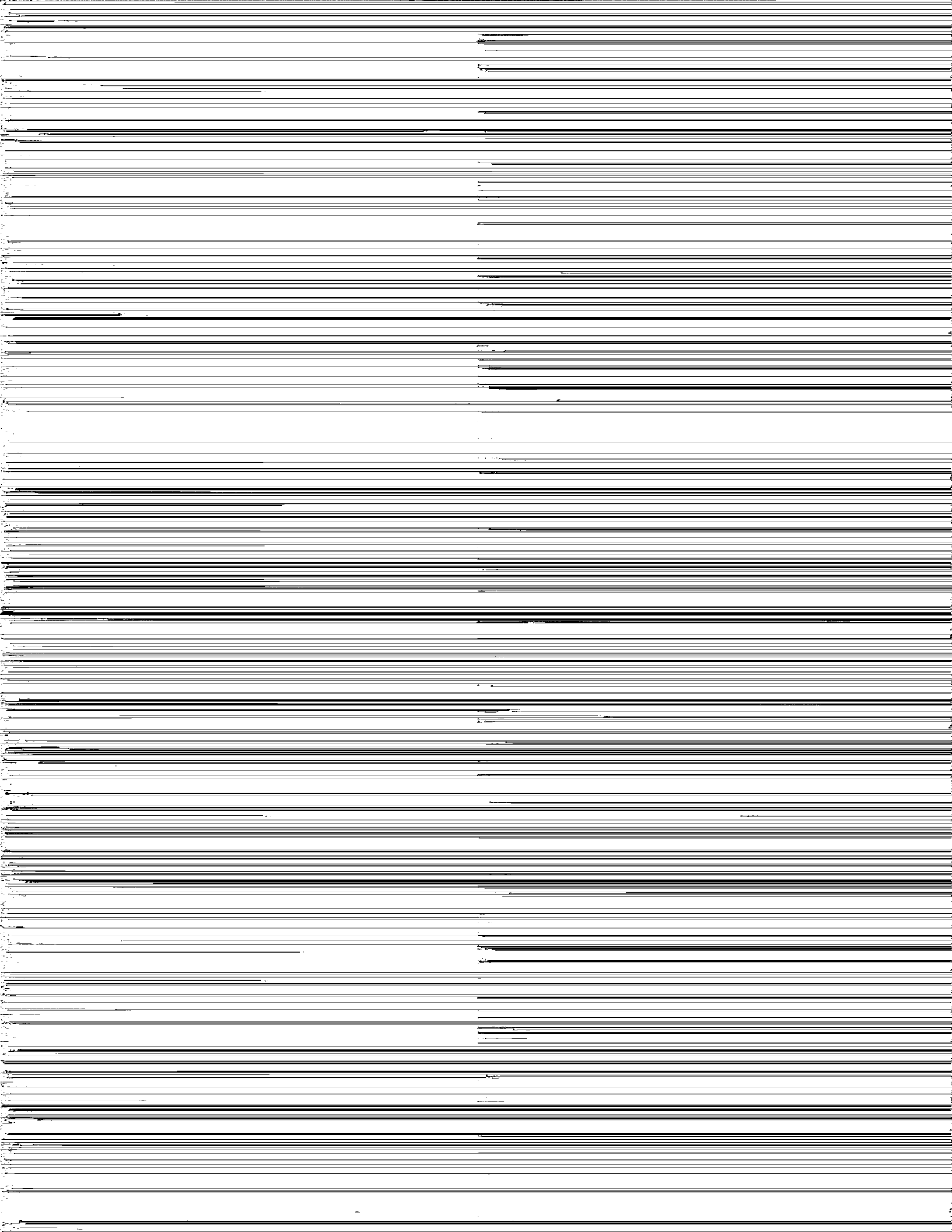


FE - EXAM : MATHEMATICS

~~_____~~



2. What is the value of θ (less than 2π) that will satisfy the following equation?

$$\sin^2\theta + 4\sin\theta + 3 = 0$$

(A) $\frac{\pi}{4}$.

(B) $\frac{\pi}{2}$.

(C) π .

(D) $\frac{3\pi}{2}$.

3. What are the coordinates of the center and the radius, respectively, of the following equation for a circle?

$$x^2 + y^2 + 12y - 2x + 12 = 0$$

(A) $(1, -6); 10$

(B) $(-1, 6); \sqrt{12}$.

(C) $(-1, 6); 25$

(D) $(1, -6); 5$

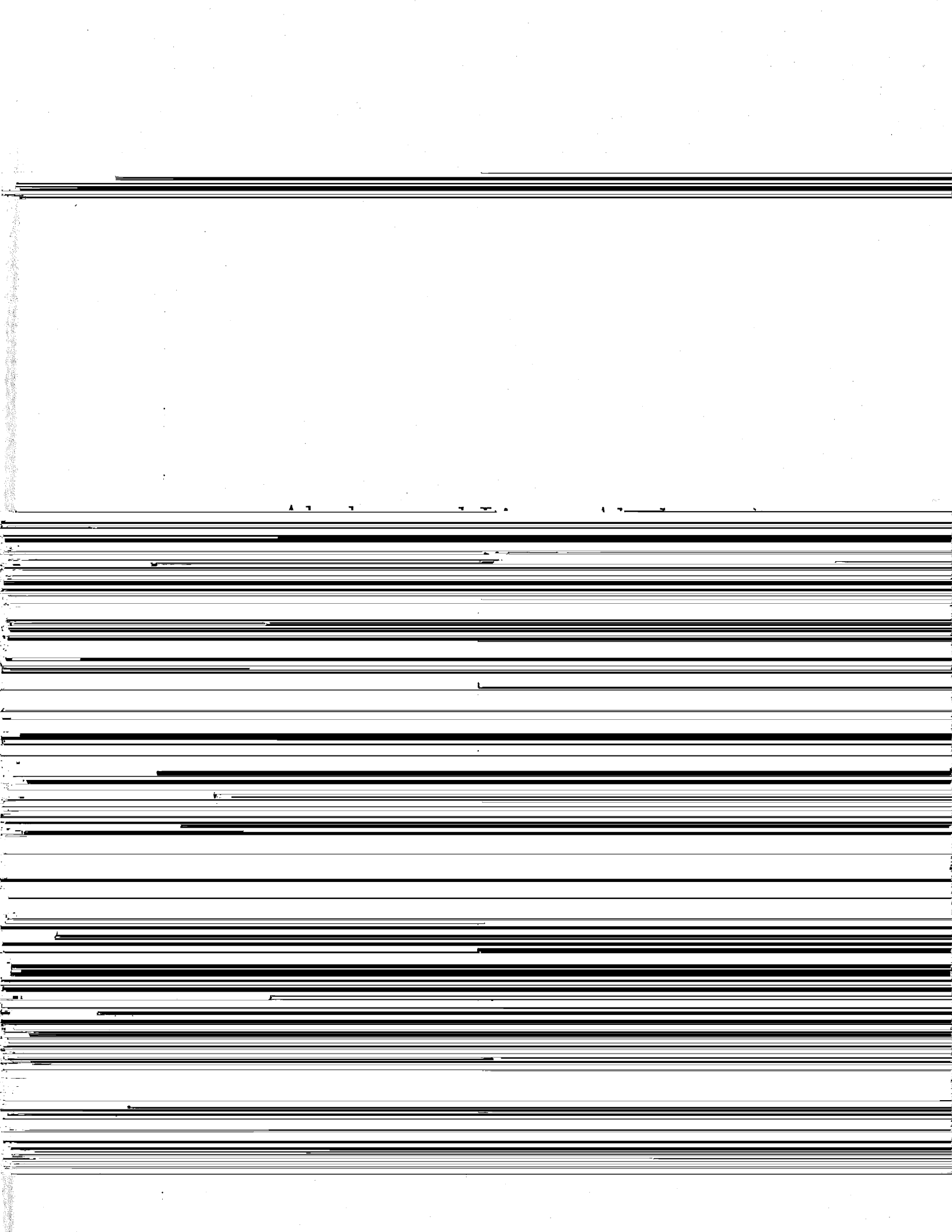
the following equation? (Angle α corresponds to a right triangle with adjacent side x , opposite side y , and hypotenuse r .)

$$\sin^2 \alpha = \cos \alpha$$

$AC = 25$. What are the lengths BC and BD , respectively?

D

to be $37^{\circ}11'$. The observer walks 170 ft directly away from point A and the flagpole
to point B and find the new angle to be $25^{\circ}43'$. What is the approximate height



7. Which of the following numbers is equal to $\log_8(50)$?

(A) 0

(B) 0.53

(C) 0.79

(D) 1.88

8. What value of A satisfies the expression $A^{-6/8} = 0.001$?

(A) 0

(C) 1000

(D) 10,000

9. What is the polar form of the complex number $z = 3 + 4i$?

(A) $(3)(\cos 36.87^\circ + i \sin 36.87^\circ)$

(B) $(3)(\cos 53.15^\circ + i \sin 36.87^\circ)$

(C) $(4)(\cos 53.15^\circ + \sin 53.15^\circ)$

dinates of $(4, 6)$?

(A) $(4, 6^\circ)$

11. Which of the following choices is closest to the rationalized form of complex number

$$\frac{1}{3 + j4}$$

(A) $-0.030 + j1.8$

(B) $1.67 - j0.5$

(C) $2.33 + j1.2$

(D) $2.33 + j1.3$

12. What is the determinant of the following matrix?



h

(A) -8

(B) -4

(C) 0

(D) 4

13. Problems A and B refer to the vectors A and B .

$$A = 2i + 4j + 8k$$

$$B = -2i + j - 4k$$

(A) What is the dot product, $A \cdot B$, of the vectors?

(A) $-4i + 4j - 32k$

(B) $-4i - 4j - 32k$

(C) -40

(D) -32

(B) What is the cross product, $A \times B$, of the vectors?

(A) $-24i - 8j + 10k$

(B) $-24i + 8j + 10k$

(D) $-4i + 4j - 32k$

14. What is the volume of a parallelepiped with sides represented by the zero-based vectors **A**, **B**, and **C**?

$$A = 2i - 2j + k$$

$$B = 4i + 2j + 2k$$

$$C = i + 5j + 4k$$

(A) 14

(B) 28

(C) 35

(D) 42

15. What is the matrix product AB of matrices A and B ?

$$A = [1 \ 2 \ 3] \quad B = \begin{bmatrix} 2 \\ -3 \\ 4 \end{bmatrix}$$

(A) $\begin{bmatrix} 2 \\ -6 \\ 12 \end{bmatrix}$

(B) $[8]$

(C) $[20]$

$$8x - 2y + 9z = 5$$

$$8x + y - 10z = 5$$

16. What is the cofactor matrix of the coefficient matrix?

17 What is the sum of the following finite sequence of terms?

18, 25, 32, 39, ..., 67

(A) 181

(B) 213

(C) 234

(D) 240

- I. An infinite power series converges for $x < 1$.
- II. Power series can be added together or subtracted within their interval of convergence.

00. [Illegible text]

Probability and Statistics

21. Four fair coins are tossed at once. What is the probability of obtaining three heads and one tail?

(A) $\frac{1}{4}$

(B) $\frac{3}{8}$

(C) $\frac{1}{2}$

(D) $\frac{3}{4}$

22 What is the sample variance of the following numbers?

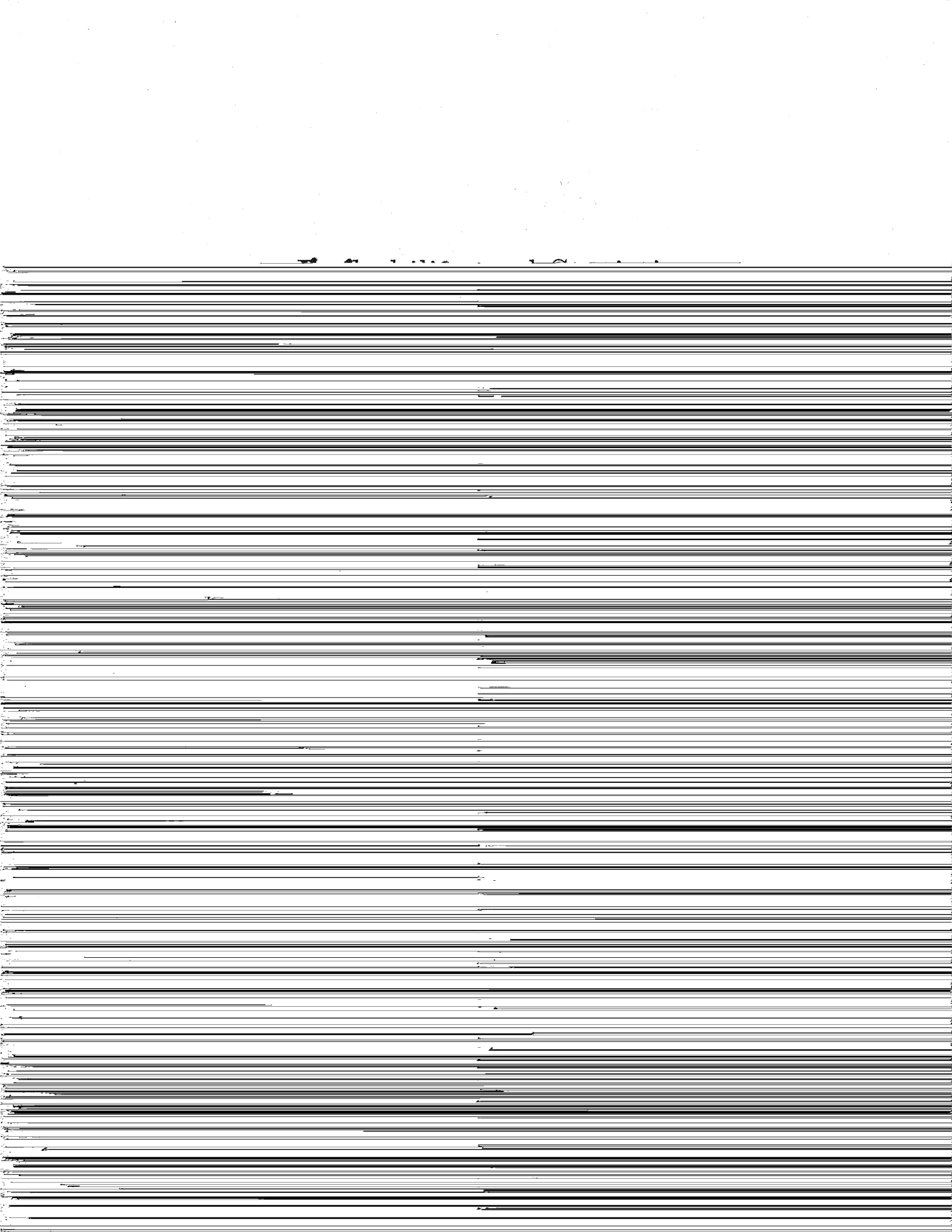
2, 4, 6, 8, 10, 12, 14

99. A box contains 100 balls numbered 1 to 100. One ball is drawn from the box. What

24. What is the maximum value of the following function?

$$y = 2x^3 + 12x^2 - 30x + 10$$

- (A) -210
- (B) -36
- (C) -5
- (D) 210



$$f(t) = u(t-1) + u(t-2)$$

(B) $\frac{e^{-s} + e^{-2s}}{s}$

(C) $1 + \frac{e^{-2s}}{s}$

(D) $\frac{e^s}{s} + \frac{e^{2s}}{s}$

25. What is dy/dx if $y = (2x)^x$?

(A) $(3x)^x(2 + \ln 2x)$

(B) ~~$2x(1 + \ln 2x)$~~

$2x(1 + \ln 2x)$

(C) $(2x)^x(\ln 2x^2)$

(D) $(2x)^x(1 + \ln 2x)$

$$v = 3x^2 + 9xy - \frac{y}{\ln(x)} + \cos(z^2 + x)$$

(A) $9x - \frac{1}{\ln(x)}$

(B) $6x + 9x - \frac{1}{\ln(z)} - \sin(z^2 + x)$

(C) $3x^2y + \frac{9xy^2}{2} - \frac{y^2}{2\ln(z)} + \frac{\sin(z^2+x)}{z^2+x}$

(D) $9x + \frac{1}{\ln(z)}$

27. Evaluate the following limit

$$\lim_{x \rightarrow \pi} \left(\frac{x^2 - \pi x + \sin x}{-\sin x} \right)$$

(A) 0

(B) 1

(C) $\pi - 1$

28. Determine the following indefinite integral.

$$\int \frac{x^3 + x + 4}{x^2} dx$$

(A) $\frac{x}{4} + \ln|x| - \frac{4}{x} + C$

(B) $\frac{x^2}{2} + \ln|x| - \frac{2}{x^2} + C$

(C) $\frac{x^2}{2} + \ln|x| - \frac{2}{x^2} + c$

(D) $\frac{x^2}{2} + \ln|x| - \frac{4}{x} + C$

29. What is the volume of revolution from $x = 0$ to $x = 3/2$ when the function $f(x) = 3x - 2x^2$ is revolved around the y -axis?

(A) $3\pi/2$

(B) $27\pi/16$

(C) $13\pi/7$

(D) $35\pi/18$

Problems 30-31 refer to the following equation and initial conditions.

$$8y = e^{-2x} - 10y' - 2y''$$

$$y(0) = 1$$

$$y'(0) = -\frac{3}{2}$$

30. What type of differential equation is shown?

(A) nonlinear, second-order, nonhomogeneous

(B) linear, second-order, homogeneous

(C) linear, second-order, nonhomogeneous

32. What is the correct general solution for the following differential equation?

$$d^2y + dy + y = 0$$

(A) $y = C_1 \sin x - C_2 \cos x$

(B) $y = C_1 \cos x - C_2 \sin x$

(C) $y = C_1 \cos x + C_2 \sin x$

(D) $y = e^{-x}(C_1 \cos x + C_2 \sin x)$

33. What is the Laplace transform of $\sin t \cos t$?

(A) $\frac{1}{s}$

(B) $\frac{1}{s+2}$

(C) $\frac{1}{2s+2}$

(D) $\frac{1}{2s+4}$

$$\mathcal{L}(s) = \frac{20}{s(s+10)}$$

34. What is the partial function expansion of $\mathcal{L}(s)$?

(A) $\frac{1}{s} - \frac{1}{s+10}$

(B) $\frac{1}{s} - \frac{2}{s+10}$

(C) $\frac{2}{s} - \frac{1}{s+10}$

(D) $\frac{2}{s} - \frac{2}{s+10}$