

MATH 105

The final exam is on Friday, December 15, 10:30 AM - 12:30 PM, in BT 1688.

Sample Final Exam

- No books or calculators are allowed.
- One letter size (both sides) sheet of notes is allowed.
- Please show all your work.
- Please simplify your answers.

1. Evaluate: $\frac{6! \cdot 6^{1.5}}{2! \sqrt{24}}$

2. Solve the inequality:

(a) $3x + 6 < 5 - x$

(b) $6x - 8 > x^2$

3. Find an equation of the line through $P(2, -4)$ and $Q(-1, 5)$.

4. Let $f(x) = 8x - 1$, $g(x) = \sqrt{x - 2}$.

(a) Find $f \circ g(x)$ and its domain.

(b) Find $g \circ f(x)$ and its domain.

5. Sketch the graph of the function:

(a) $f(x) = \sqrt{x - 2} + 1$

(b) $g(x) = \frac{e^x}{2}$

(c) $h(x) = (x + 1)(x - 2)(x - 5)$

6. Simplify:

(a) $\log_5 \sqrt[3]{5}$

(b) $\sin(\pi) - 3 \cos\left(\frac{\pi}{6}\right)$

7. Sketch the graph and find an equation of a rational function f that satisfies the following four conditions:

- f has a vertical asymptote $x = -3$
- f has a horizontal asymptote $y = 0$
- 5 is an x -intercept of f
- 4 is a y -intercept of f

8. Solve the equation: $\ln 3^{(x^2)} = 5$

9. A conical paper cup is constructed by removing a sector from a circle of radius 5 inches and attaching edge OA to OB (see the figure). Find angle AOB so that the cup has a depth of 4 inches.

10. Find all real solutions of the equation: $\tan(2x) \cos(2x) = 1$.

11. Solve the system:
$$\begin{cases} x - 3y = 4 \\ -2x + 6y = 2 \end{cases}$$

12. Evaluate:
$$\sum_{k=1}^4 (k-1)(k+1)$$

13. Express the sum in terms of summation notation:
$$\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \cdots + \frac{1}{99 \cdot 100}$$

14. Sketch the graph of the equation:

(a) $10y = 100 - x^2$

(b) $4x^2 + y^2 - 24x + 4y + 36 = 0$