Math 110 Final Exam

December 17, 2024

Time: 2 hour and 30 minutes

Instructions: Show all work for full credit.
No outside materials or calculators allowed.

Extra Space: Use the backs of each sheet
for extra space. Clearly label when doing so.

Name: _____

ID #: _____

Instructor/Section: _____

"I pledge by my honor that I have abided by the NJIT Academic Integrity Code."

_____ (Signature)

Problem		Score
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

1. Use a system of equations to find the equation of the circle that passes through the points (5 , 3), (-1 , -5), and (-2 , 2) in the form $y = x^2 + y^2 + ax + by + c = 0$ (6 pts)

2. Use partial fraction decomposition to simplify the following: $\frac{x^3+3x^2-4x-8}{x^2-4}$ (6 pts)

3. Solve the following log or exponential equations (4 pts each)

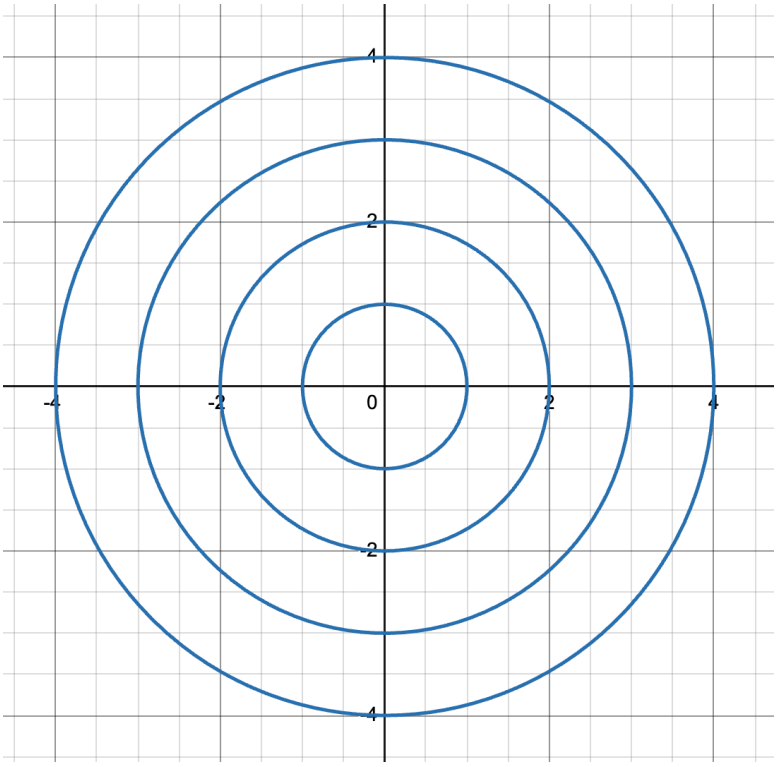
a. $log_4(x+1) + log_4 2 = 1$

b. $5^{x+9} + 7 = 93$

c. $\log(-n-10) = \log(n+8)$

d. $10 \cdot 10^x - 9 = 8$

4. Graph the following polar equation: $r^2 = 9\cos(2\theta)$ (4 pts)



5. Evaluate the following: (3 pts each)

   a. $\log_4 \frac{1}{16}$

   b. $\cos(1035°)$

   c. $\sin\left(-\frac{\pi}{12}\right)$

   d. $e^{-\ln(34)}$

6. Solve the following equations for all solutions within $[0\ ,\ 2\pi)$: (5 pts each)

a. $-3 = -4 + tanx$

b. $5 - \frac{1}{2}\cos(-2x) = \frac{19}{4}$

c. $2sin\theta = 3sin\theta - \sqrt{2}sin\theta cos\theta$

d. $-3 - tan^2\theta = 3sec\theta$

7. Evaluate the following limits (4 pts each)

   a. $\lim_{x\to 3} \frac{3x-7}{(x-4)^2}$

   b. $\lim_{x\to \pi} e^{sinx}$

   c. $\lim_{x\to -1} \frac{\sqrt{x^2+8}-3}{x+1}$

8. Consider the function $f(x) = 3x - 82$

   a. Find the average rate of change for f(x) by using the difference quotient $\frac{f(x+h)-f(x)}{h}$, and fully simplify (4 pts)

   b. Find the instantaneous rate of change by taking the limit of the result from part a as $h \to 0$ (2 pts)

9. Given $\alpha = sin^{-1}\left(\frac{3}{8}\right)$ and $\beta = cos^{-1}\left(-\frac{2}{5}\right)$ find the following: (10 pts total)

   a. $\sin(2\alpha)$

   b. $\cos\left(\frac{\beta}{2}\right)$ (*assume $\frac{\beta}{2}$ is in quadrant 1)

   c. $\cot(\beta)$

10. True/False; no work required (2 pts each)

   a. The Law of Sines is used to find the area of an ASA triangle

   b. The period of the function $y = \tan\left(\frac{x}{2}\right)$ is 2π

   c. The expression $17^2 = 289$ is equivalent to $\log_{17} 289 = 2$

   d. The angle $\frac{3\pi}{18}$ is the reference angle for $150°$