University of California, San Diego
Department of Mathematics

Instructions: Turn off and put away your cell phone. No calculators or electronic devices are allowed. You may use one page of notes, but no books or other assistance. Show all of your work; no credit will be given for unsupported answers. No credit will be given for illegible solutions.

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1. Find the equation of the line passing through the points $(-2, 4)$ and $(3, 5)$. [6]

2. List the transformations (shifts, stretches, etc.) that change the parabola $y = x^2$ into the parabola $y = 2x^2 + 4x - 1$. *(Hint: Complete the square.)* [6]

3. Write $\dfrac{x^3 + 2}{x + 1}$ in the form $G(x) + \dfrac{a}{x + 1}$, where $G(x)$ is a polynomial and a is a constant. [6]

4. Find a polynomial $P(x)$ of degree 3 such that 2, -3, and 5 are zeros of $P(x)$ and $P(1) = 32$. [8]

5. Let $f(x) = \sqrt{x - 5}$. [8]
   (a) Find a formula for f^{-1}.
   (b) What is the domain of f?
   (c) What is the domain of f^{-1}?

6. Let $f(x) = 2 \ln x$ and $g(x) = e^{2x}$. [8]
   (a) Compute $(f \circ g)(x)$. (Simplify your answer.)
   (b) Compute $(g \circ f)(x)$. (Simplify your answer.)
   (c) Is f the inverse of g? Why or why not?

7. Find all solutions to the following system of equations: [8]

$$x^2 + y^2 = 8 \quad \text{and} \quad xy = 4.$$

8. Evaluate the following: [8]
   (a) $\cos(0)$
   (b) $\sin\left(-\dfrac{\pi}{6}\right)$
   (c) $\cos\left(\dfrac{3\pi}{2}\right)$
   (d) $\sin(99\pi)$

9. Suppose $-\frac{\pi}{2} < \theta < \frac{\pi}{2}$ and suppose $\sin\theta = -\frac{1}{3}$. Evaluate $\cos\theta$. [6]

10. Find the exact value of $\cos\left(\sin^{-1}(\frac{2}{7})\right)$. [8]

11. Find all x values in the interval $[0, 2\pi]$ that are solutions to the equation: [8]

$$\left|\cos x - \frac{1}{4}\right| = \frac{1}{4}.$$

Total Points: 80