Name:

Midterm

Please show all of your work, and justify your answers completely. A correct answer with no work shown does not guarantee full points. No calculators or outside sources of assistance are permitted. You may use your brain. There are 15 problems, each is worth four points for a total of 60 points. Relax, take your time, and you will do fine. Oh, and don’t cheat! Good luck!

Academic Honesty Certification

I certify that all of the work is my own and that I have taken this exam without the aid of unauthorized materials.

Signature: ___________________________ Date: ___________________________

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<tr>
<th>Problem</th>
<th>Points</th>
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<td>1-4</td>
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1. True or False: If the equation of a circle is $x^2 + 6x + y^2 - 8y = 0$, then the circle is centered at $(3, -4)$ and has radius 5.

2. True or False: Let $f(x)$ be a polynomial. If 2 is a root of $f(x)$, this means $f(2) = 0$.

3. True or False: Let $f(x)$ be a polynomial. If 2 is a root of $f(x)$, this means $x + 2$ divides $f(x)$ with no remainder.

4. True or False: $y - 1 = \frac{2}{3}(x - 3)$ and $y = \frac{2}{3}x - 3$ represent the same line.
5. Let $f(x) = x^2 - 3x + 1$. Find $f(0)$, $f(2)$, and $f(x + h)$.

6. Find the inverse of $f(x) = 5(x - 2)^3 - 6$. 
7. State the quadratic formula, if \( cx^2 + ax + b = 0 \).

8. Find all roots to the following polynomial using the rational root theorem and division:
   \[ f(x) = x^3 - 4x^2 + x + 6. \]
9. Sketch the graph of \( f(x) = (x - 3)^2 - 4 \). Graph must have clearly labeled points to get full credit.

10. Sketch the graph of \( x^4 - 13x^2 + 36 \). Make sure you label all \( x \)-intercepts.
11. Solve: \(|5 - 4x| \leq 1\).

12. Find all intervals where the following inequality is true: \(x^2 + 8x > -15\).
13. Let $f(x) = x^2 - 1$ and $g(x) = \frac{1}{x}$. Find $f \circ g(x)$ and $g \circ f(x)$ and state the domain for each.

14. Find all real solutions: $\sqrt{y - 10} - \sqrt{y - 2} = 2$. 
15. Let \( f(x) = \frac{x^2 - 4}{(x + 2)(x - 3)} \). Find all horizontal, vertical and oblique asymptotes, and state if the function has any holes.

Extra Credit #1: Name a Beatles song. (Must be unique!)

Extra Credit #2: What is your favorite line from the Gettysburg Address or the Declaration of Independence. (Cannot be: "Four score and seven years ago...”)

Extra Credit #3: Name one of the 50 United States of America. (Must be unique!)

End of midterm.