

MATH 120
SPRING 2023
EXAM 3

NAME:

1. 10 pts. Complete the square and write the equation $x^2 + y^2 - 4x + 2y - 4 = 0$ in the standard form (or center-radius form) for a circle. What is the center and radius of the circle?
2. 5 pts. each A circle contains points $(3, 6)$ and $(5, 4)$, and the line segment connecting these points contains the center of the circle.

 - (a) Find the coordinates of the circle's center.
 - (b) Find the radius of the circle.
 - (c) Write the standard form (or center-radius form) of the circle's equation.
3. 10 pts. Find the vertex of the parabola given by $f(x) = 2x^2 - 5x - 6$. In interval notation, what is the domain and range of the function?
4. 10 pts. A parabola contains the point $(-2, -3)$ and has vertex $(-3, -1)$. Write the equation of the parabola in vertex form.
5. 10 pts. Divide using long division: $(x^4 + 2x^2 - 5x - 16) \div (x^2 - 2)$.
6. 10 pts. Find a 3rd-degree polynomial function f having real coefficients, zeros 2 and $2 - 3i$, and such that $f(1) = -10$.
7. 15 pts. Consider the equation

$$x^4 - x^3 + 2x^2 - 4x - 8 = 0.$$

List all the possible rational roots. Use synthetic division to test the possible rational roots and find actual roots. Then find *all* solutions to the equation, real or complex.
8. 20 pts. Use the 7-step procedure used in homework to sketch a graph of the rational function

$$R(x) = \frac{x^2 - 3x - 4}{x^2 - x - 6}.$$

The steps are: (1) Domain; (2) Symmetry; (3) Intercepts; (4) Vertical asymptotes and holes; (5) Horizontal/slant asymptote; (6) Plot additional points; (7) Graph.
9. 10 pts. each Solve each inequality, showing use of test values and the Intermediate Value Theorem. Put answers in interval notation.

 - (a) $2x^2 + 9x + 4 < 0$
 - (b) $\frac{x - 6}{x + 2} \geq 0$