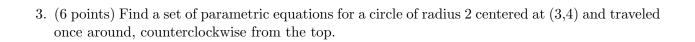1. (10 points) Use the Taylor coefficient formula to find the Taylor series **centered at x = 2** for $f(x) = 1/x^2$.

2. (10 points) Use Taylor Series to approximate $\int_0^1 e^{-x^2}\, dx$ with error less than 0.01. Use as few terms as are necessary and explain how you know you have used enough terms.

3. (6 points) Find a set of parametric equations for a circle of radius 2 centered at (3,4) and traveled once around, counterclockwise from the top.

4. A closed curve that intersects itself only at the endpoints is defined parametrically by

$$x = t^3 - 3t, \quad y = 3t^2, \quad -\sqrt{3} \le t \le \sqrt{3}.$$

(a) (6 points) Determine whether the curve is traveled clockwise or counterclockwise. (Justify your answer!) Then derive an integral representing the area enclosed by the curve. You need not compute the integral.

(b) (8 points) Determine the perimeter of the curve. The exact answer is required for full credit.

5. (6 points) Compute $\displaystyle\lim_{x\to 0} \frac{\sin(x^3) - x^3}{x^9}$.

6. (6 points) Determine the point(s) for which the curve $x=t^3-12t$, $y=3t^4-4t^3-12t^2$ has a vertical tangent.

7. (8 points) A cone of radius r and height h is created by rotating the line segment from (0,0) to (h,r) around the x-axis. Derive the surface area formula for a cone using calculus.