

Practice Exam III

1. Find the focus and directrix of the parabola given by $y^2 = 16x$. Find the equation of the line tangent to this parabola at $(1, -4)$.
2. Find the vertices and focus of the ellipse given by

$$\frac{x^2}{16} + \frac{y^2}{4} = 1.$$

3. Write the equation

$$9y^2 - 4x^2 - 54y - 16x + 29 = 0$$

in standard form, i.e.

$$\frac{(y - y_0)^2}{b^2} - \frac{(x - x_0)^2}{a^2} = 1.$$

4. Find $\frac{dy}{dx}$ for the parametric curve given by

$$x = 3\tau^2, \quad y = 4\tau^3, \quad \tau \neq 0$$

without eliminating the parameter.

5. Convert the equation

$$x - 3y + 2 = 0$$

to polar coordinates.

6. Find the slope of the tangent line to $r = 2 \cos \theta$ at $\theta = \pi/3$.
7. Find the area inside the curve given by $r = 2 + \cos \theta$.
8. Find the auxiliary equation for $y'' - 5y' + 6y = 0$. Write down the general solution to this differential equation. Write down a particular solution to the equation satisfying the initial conditions $y(0) = 0$ and $y'(0) = 1$.