

Due Friday, March 28, 2025.

Problem 1 (Thomas Problem §9.1 # 9). Find the general solution of the differential equation

$$2\sqrt{xy} = 1, \quad x, y > 0.$$

Problem 2 (Thomas Problem §9.1 # 17). Find the general solution of the differential equation

$$2x\sqrt{1-y^2}.$$

Problem 3. Find the particular solution of the initial value problem

$$2\frac{dy}{dx} = \frac{3x^2}{y}, \quad y(2) = 5.$$

Problem 4. Let R be the region bounded by $x = 0$, $x = \ln(2)$, $y = 0$, $y = e^x$. Find the area of R .

Problem 5. Let R be the region bounded by $x = 0$, $x = \ln(2)$, $y = 0$, $y = e^x$. Find the volume of the solid obtained by revolving R about the x -axis.

Problem 6. Let

$$f(x) = \frac{x}{x^2 + 1}.$$

Find the average rate of change of f on the interval $[0, 2]$.

Problem 7. Let

$$f(x) = \frac{x}{x^2 + 1}.$$

Find the average value of f on the interval $[0, 2]$.

Problem 8. Let

$$f(x) = \frac{x}{x^2 + 1}.$$

Find the average value of f on the interval $[0, \infty)$.

Problem 9. Consider the curve which is the locus of

$$xy^2 - x^2y = 6.$$

Verify that the point $(2, 3)$ is on the curve.

Find the equation of the line tangent to the curve at the point $(2, 3)$.

Problem 10. Consider the curve which is the locus of

$$xy^2 - x^2y = 6.$$

Find all points at which the curve admits a vertical tangent line.