

There are 100 points on this exam. Show **ALL** work. Justify your steps using **COMPLETE** sentences. GOOD LUCK!

1. (7 points) Find the x -intercepts and the y -intercepts of the curve $x^2 + 2y^2 = 1$.
2. (7 points) Sketch the line $2x + 3y = 1$ and find its slope.
3. (7 points) Let $A = (3, 5)$, $B = (1, 1)$, $C = (-1, 0)$. Find the distance between the midpoint of the segment AB and the point C .
4. (7 points) Find the equation of the circle with center $O = (-1, 2)$ that is tangent to the x -axis. What is its radius?
5. (7 points) Find the center and the radius of the circle with equation
$$x^2 + y^2 + 2x + 2y = 0.$$
6. (7 points) Find the equation of the line that passes through the point $(0, 1)$ and is perpendicular to the line $y = 2x + 1$.
7. (7 points) Determine whether the points $A = (0, -2)$, $B = (1, 1)$, $C = (-1, -5)$ belong to the same line.

8. (7 points) Find the domain of the function

$$f(x) = \frac{1}{(x-2)(x+3)} + \sqrt{2x+6}.$$

9. (13 points) Sketch the graph of the function $f(x) = |x+1| + |x-1|$. At which intervals is $f(x)$ increasing/decreasing? What are the relative maximum/minimum values of the function?

10. (7 points) Let $f(x) = 1/x$, $g(x) = 1/(x+1)$. Show that for $x \neq -1, 0$ we have

$$f(g(x)) \cdot g(f(x)) = x.$$

11. (7 points) Determine which of the following functions is odd or even:

$$f(x) = x + \frac{1}{x}, \quad g(x) = \frac{1}{x^2 + 1}, \quad h(x) = x^3 + 1.$$

12. (7 points) Sketch the graph of the function $f(x) = -(x+1)^2$.

13. (10 points) Solve the equations (i) $2x^2 + 3x + 1 = 0$ and (ii) $x^2 + 2x + 2 = 0$.