

There are 215 points on this exam. You need 200 points to get a perfect score. Show **ALL** work. Justify your steps using **COMPLETE** sentences. GOOD LUCK!

1. (20 points) (a) Find the slope and sketch the graph of the line $2x + 3y = 6$.

(b) Find the equation of the circle with center $O = (1, 2)$ that passes through the point $(2, 3)$.

2. (20 points) Sketch the graph of the function $f(x) = |2x + 1| + |x - 1|$.

3. (20 points) Graph the function $f(x) = 2x^2 - 4x - 6$ and find its minimum value.

4. (25 points) Solve the equations:

$$(a) \frac{3x}{x+2} - \frac{6}{x} = \frac{12}{x^2+2x}, \quad (b) \sqrt{x} - \sqrt{x-5} = 1, \quad (c) |x| = x + 1.$$

5. (20 points) Solve the inequalities

$$|3x + 4| < 13, \quad \frac{x^2 - 1}{(x + 2)(x - 3)} > 0.$$

6. (25 points) (a) Find a polynomial p with rational coefficients such that $p(-1) = p(1) = p(\sqrt{3}) = 0$

(b) Sketch the graph of the polynomial $p(x) = (x^2 - 1)(x - 2)$.

7. (20 points) Find the rational solutions of the equation

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

8. (25 points) Solve the equations:

$$(a) x + \ln e^x = 2^{\log_2 3}, \quad (b) \log(x + 5) - \log(x + 3) = 1, \quad (c) 3^{5x} \cdot 9^x = 27.$$

9. (20 points) A bank compounds interest continuously and your money doubles every 10 years.

(a) What is the interest rate?

(b) If you invest now 10,000\$ when are you going to have 1,000,000\$?

(Your answers should involve logarithms.)

10. (20 points) Solve the system of equations

$$x + 2y + 2z = 11$$

$$x - y + z = 2$$

$$3x + 6y - 4z = 3.$$