

HOMEWORKS 8 & 9 - MATH 111

DUE DATE: Monday, December 5

INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 1 point. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Solve the following 2×2 -system by substitution:

$$\begin{cases} 3x + 2y = -4 \\ 4x - 2y = -10 \end{cases}$$

2. Solve the following 3×3 -system by the Gauss-Jordan method.

$$\begin{cases} x + y - z = 6 \\ 2x - y + z = -9 \\ x - 2y + 3z = 1 \end{cases}$$

3. Find the solution set of the following system of linear inequalities.

$$\begin{cases} 3x + 2y \leq 6 \\ -2x + 4y \leq 8 \\ x + y \geq 1 \\ x \geq 0, y \geq 0 \end{cases}$$

4. Find the equation of the straight line that is

(a) parallel to the line $y = 5x - 7$ and passes through the point $(-1, 9)$.

(b) perpendicular to the line with equation $2x + 6y = 7$ and passes through the point $(2, -5)$.

5. A company that produces item X has fixed operating costs of \$200. The total cost for producing 20 items is \$800. Find an equation for the total cost $C(x)$ in terms of the number x of items produced assuming linear dependency. Then find the average cost per item for producing 20 items.

6. Find the equation of the parabola with vertex at $(2, 7)$ going through the point $(-1, -2)$.

7. Find the vertex, the opening direction, the intercepts and, then, roughly sketch the graph of the parabola $f(x) = x^2 - 8x - 20$.

8. The manager of a bicycle shop has found that, at a price of $p(x) = 150 - \frac{x}{4}$ per bicycle, x bicycles will be sold.

(a) Find an expression for the total revenue from the sale of x bicycles.

(b) Find the number of bicycles that have to be sold to maximize revenue.

(c) Find the maximum revenue.

9. Find the intercepts, form the sign table and, then, roughly sketch the graph of the polynomial function $f(x) = x^3 - 2x^2 - 8x$.
10. Solve the polynomial inequality $x^4 - 9x^2 \leq 0$.
11. Find the domain, the intercepts, the asymptotes, form the sign table and, then, roughly sketch the graph of the rational function $f(x) = \frac{x-3}{x^2-4x-5}$.
12. Solve the rational inequality $\frac{(x-1)(x+5)(x-2)}{x^3-7x} \geq 0$.
13. Use the values at $x = -1, 0, 1$ to roughly sketch the graph of the function $f(x) = 3^x$. Then use transformations to obtain the graph of $g(x) = 2 \cdot 3^{x+2}$.
14. Find the domain of the function $f(x) = \log_{43} \frac{x+2}{x^2-7x+12}$.
15. Use the three-value table to roughly sketch the graph of the function $f(x) = \log_{1/2} x$.
16. If you invest an amount of \$1,000 now, how much interest should the bank pay compounded quarterly so that you will have \$2,000 in 10 years time?
17. Suppose that the population of a small island is 250 people. It is growing at a continuously compounding rate and is estimated to double in 20 years. Find an equation expressing the population $P(t)$ on the island after t years. What will the population be in 5 years time?