Math 11100 Exam Jam

Contents

1 Linear Inequalities and Absolute Value Equations

1. Solve the following expressions.
   a. $|y+2|-1=10$
   b. $|2x-1| \geq 7$
   c. $|x+5|-6 \leq -1$

2. Solve and graph the solutions for the following inequalities. Also write the solutions in interval notation.

   a. $4 - 3x \geq 10$ **or** $5x - 2 > 13$

   b. $7x + 4 \geq -17$ **and** $6x + 5 \geq -7$

2 Linear Equations, Graphing and Solving Systems of Equations

3. Find the equation of the line through $(-5, -2)$ that is perpendicular to $-5x - 2y = 27$. Write the equation in slope-intercept form.

4. Find the equation of the line that goes through $(-3, 7)$ and $(2, -1)$ and write it in standard form.

5. a. Solve the following system of equations.

   b. Is the system consistent or inconsistent? Are the equations dependent or independent?

$$\begin{cases} 9x + 5y = -19 \\ 4x - 3y = 2 \end{cases}$$

6. a. Solve the following system of equations.

   b. Is the system consistent or inconsistent? Are the equations dependent or independent?

$$\begin{cases} 2x - 7y = -20 \\ -6x + 21y = 15 \end{cases}$$

7. Solve each problem.

   a. Heather paid \$16 for her phone. Her monthly service fee is \$40. Formulate a linear function to model the cost, $C(t)$, for t months of service, and determine the amount of time required for the total cost to reach \$560.

   b. Rosanna walks 2 mph slower than Simone. In the time it takes Simone to walk 8 mi, Rosanna walks 5 mi. Find the speed of each person.

   c. A well and a spring are filling a swimming pool. Together they can fill the pool in three hours. The well working alone can fill the pool in 8 hours less time than the spring. How long will the spring take working alone to fill the pool?

8. Find the domain.

   a. $f(x) = \sqrt{4 - 9x}$

   b. $f(x) = \dfrac{x^3 - x^2 + x + 2}{x^2 + 12x + 35}$

9. Solve.

   a. Two solutions, one with a concentration of 25% alcohol and another with a concentration of 35% alcohol, are mixed together to form 20 gallons of solution. How many gallons of each should be mixed together if the result is to have a concentration of 32% alcohol?

   b. Paint Town sold 45 paintbrushes, one type at \$8.50 each and another type at \$9.75 each. In all, \$398.75 was taken in for the brushes. How many of each type were sold?

   c. A cruise boat travels 72 miles downstream in 4 hours and returns to its starting point upstream in 6 hours. Find the speed of the river.

3 Polynomials and Rational Expressions

10. a. Simplify $\dfrac{(3x^5y^{-3})^{-4}}{9xy^2}$.

    b. Multiply $(3x-7y)^2$.

    c. Divide $\dfrac{x^2+3x-10}{x+5}$.

11. Factor the following expressions.

    a. $64x^9y^9 + 24x^2y^6$

    b. $m^3 + 4m^2 - 6m - 24$

    c. $8x^2 - 6x - 9$

    d. $16x^2 - 81$

    e. $8c^3 + 125$

    f. $x^2 + 6x + 9 - 4y^2$

12. Solve the following equations.

    a. $2k^2 = 9k - 9$

    b. $\dfrac{3}{k+2} - \dfrac{2}{k^2-4} = \dfrac{1}{k-2}$

13. Simplify the following expressions.

a. $\dfrac{m^2-49}{m+1} \div \dfrac{7-m}{m}$

b. $\dfrac{5x}{x^2+xy-2y^2} - \dfrac{3x}{x^2+5xy-6y^2}$

c. $\dfrac{\frac{x^2-16y^2}{xy}}{\frac{1}{y}-\frac{4}{x}}$

d. $\dfrac{(a+b)}{\frac{a}{ab}-\frac{b}{a^2}}$

4 Radical Expressions and Rational Numbers as Exponents

14. Simplify the following expressions.

    a. $\sqrt[5]{s^3} \cdot \sqrt[4]{s}$, write the answer in radical notation.

    b. $\sqrt{108}$

    c. $-\sqrt[3]{-125a^6b^9c^{12}}$

    d. $3x\sqrt[3]{xy^2} - 2\sqrt[3]{8x^4y^2}$

    e. $\sqrt{x^2 - 4x + 4}$, assume that all variables represent positive numbers.

15. Rationalize the denominator for the following expressions.

    a. $\dfrac{\sqrt{2}-\sqrt{3}}{\sqrt{6}-\sqrt{5}}$

    b. $\dfrac{\sqrt{a}}{\sqrt{a}+\sqrt{b}}$

16. Multiply.

    a. $(3\sqrt{7}+2\sqrt{5})(2\sqrt{7}-4\sqrt{5})$

    b. $(\sqrt{3}-\sqrt{2})^2$

17. Solve the following equations.

    a. $\sqrt[3]{x-8}+3=0$

    b. $5=\sqrt{7x-3}$

    c. $(2w-1)^{2/3}-w^{1/3}=0$

5 Quadratic Equations and Functions

18. Solve the following equations.

    a. $(t+5)^2 = 48$

    b. $y^2 - 14y + 49 = 4$

19. Find the value of c such that $9x^2 - 30x + c = 0$ has exactly one solution.

20. For the quadratic function, $f(x) = -2x^2 - 2x + 3$, find the following:

    a. The vertex
    b. The line of symmetry
    c. The maximum or minimum value
    d. The x-intercepts
    e. The y-intercepts
    f. The graph of the function

21. A club swimming pool is 30 feet long. The area of the pool is 1200 ft^2. The club members want a paved walkway in a strip of uniform width around the pool. They have enough material to cover 296 ft^2. How wide can the strip be?

6 The Algebra of Functions, Composite Functions and Inverse Functions

22. Simplify as much as possible.

    a. Find $\frac{f}{g}$ if $f(x) = \frac{x^2 - 16}{x^2 - 10x + 25}$ and $g(x) = \frac{3x - 12}{x^2 - 3x - 10}$.

    b. Find $(f - g)(x)$ if $f(x) = \frac{5ab}{a^2 - b^2}$ and $g(x) = \frac{a - b}{a + b}$.

    c. Find $(f \cdot g)(-3)$ if $f(x) = \frac{3x}{6x^2 - 13x - 5}$ and $g(x) = 4x - 10$.

23. Determine whether or not $g(x) = \sqrt{x-3}$ is one-to-one and, if possible, find g^{-1}.

24. Find $(f \circ g)(x)$ and $(g \circ f)(x)$ given $f(x) = 4x^2 - 1$ and $g(x) = \dfrac{2}{x}$.

7 Complex Numbers and Fractions

25. Simplify $\dfrac{4+3i}{5+3i}$. Write your answer in the form $a+bi$.

26. Multiply $2i(-4-i)^2$.

27. Simplify.

    a. i^{42}

    b. i^{17}

8 Logarithmic and Exponential Functions

28. Solve the following equations.

    a. $16^{2x+1} = 64^{x+3}$

    b. $\log_4(2x+4) = 3$

    c. $2^{x+3} = 5^x$

    d. $\log_2(x) + \log_2(x-7) = 3$

29. Rewrite the following expression as a single logarithm.

$$3\log_p(x) + \frac{1}{2}\log_p(y) - \frac{3}{2}\log_p(z)$$

30. Change the base of the following logarithms and estimate them to four decimal places.

    a. $\log_\pi(e)$

    b. $3\log_6 2.75$

31. Graph.

    a. $y = \left(\frac{2}{3}\right)^x$

    b. $y = \log_2 x$

32. Solve the following problems using the interest formulas.

Compound Interest Formula:

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Continuous Compound Interest Formula:

$$A = Pe^{rt}$$

a. What will be the amount A in an account with an initial principal of \$4000 if interest is compounded continuously at a rate of 3.5% for 6 years? Also, how long does it take for the account to double?

b. A college loan of \$29,000 is made at 3% interest compounded annually. After t years, the amount, A, due is given by the function $A(t) = 29,000(1.03)^t$. If no payments are made, how long will it take for the amount due to reach \$35,000?