

QUEENS COLLEGE
DEPARTMENT OF MATHEMATICS
FINAL EXAMINATION
2 1/2 HOURS

MATHEMATICS 115

SPRING 2007

Directions: Show all work. Only algebraic solutions will be accepted. All answers must be in simplest form, reduced to lowest terms, and with positive exponents.

1. Divide: $\frac{4x^3y^4z^2}{15xy^3} \div \frac{28xy^5}{5xy}$

2. Evaluate: $27^{\frac{2}{3}} - 27^0 + 27^{-\frac{1}{3}}$

3. Combine: $\frac{4}{x+2} - \frac{2}{x-2} - \frac{8x}{x^2-4}$

4. Sketch the graph of $9y - 3x = -18$. Label the intercepts.

5. Solve for x: $\frac{x+4}{y-3x} = -5w$

6. Simplify: $(\sqrt{7x}-2)(\sqrt{7x}+2) - (7\sqrt{x}-2)^2$

7. Solve for x: $\frac{4}{x-3} - \frac{2}{x+3} = \frac{-x}{x^2-9}$

8. Write an equation of the line passing through $(-7,4)$ and $(5,-4)$.

9. Suppose $f(x) = x^2 - 3x + 2$ and $g(x) = 1 - 2x^3$. Find the following:

a. $f(3)$

b. $g(-2) + g(1)$

c. $f(2t)$

10. Write an equation of the line that passes through $(5,-2)$ and is perpendicular to the line $4x-2y = 7$.

11. Solve for x: $x^2 = 6x + 3$

12. Let $f(x) = x - 6$ and $g(x) = \sqrt{3x-4}$

a. Find the domain of $f(x)$ and the domain of $g(x)$.

b. Find the domain of $\frac{g(x)}{f(x)}$.

13. Simplify and write with positive exponents only: $\frac{(2x^{-3}y^{-1})^2}{x^7(y^{-4})^2}$

14. Rationalize each denominator and simplify: $\frac{4}{\sqrt{5}} - \sqrt{\frac{7}{45}}$

15. Solve for x: $2 + \sqrt{x-4} = x - 4$

16. Simplify: $5\sqrt{18x^7y^6} - 2x^2y\sqrt{8x^3y^4} + xy^3\sqrt{50x^5}$

17. Simplify: $\frac{3 + \frac{6}{x}}{1 - \frac{1}{x} - \frac{6}{x^2}}$

18. Solve the following system:

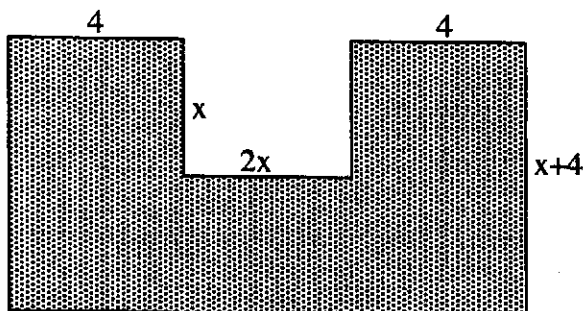
$$\begin{cases} 5x + 3y = 4 \\ 2x - 4y = -14 \end{cases}$$

19. Factor completely: $3x^3y^2 + 8x^2y^2 - 3xy^2$

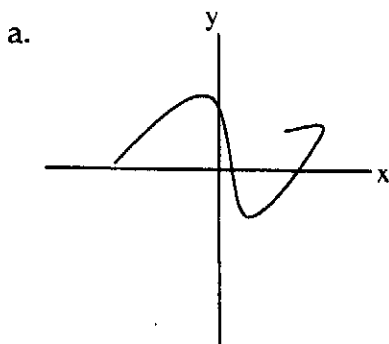
20. Solve for s: $3s^3 - 12s = 0$

21. Divide $3x^3 - 2x + 2$ by $x - 2$

22. Express the shaded area as a function of x:



23. Determine whether each of the following is a function and in each case **explain your answer**.



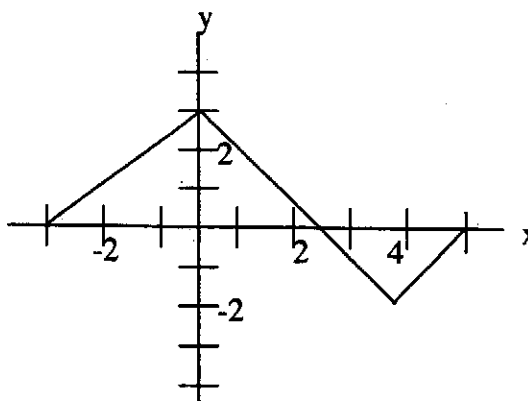
b. $\{(-5, -2), (3, -4), (5, -2)\}$

24. Use the graph of $y = f(x)$ shown to the right to find

a. the domain of $f(x)$

b. the range of $f(x)$

c. $f(0) + 2f(-3) + f(5)$



25. Ajax Car Rentals charge \$35 per day and \$.12 per mile. Best Car Rentals charge \$25 per day and \$.20 per mile.

a. Write an expression for the cost of m miles using an Ajax rental car for two days.

b. Write an expression for the cost of m miles using a Best rental car for two days.

c. For a two day rental, how many miles would cost the same using either company?