

**QUEENS COLLEGE**  
**DEPARTMENT OF MATHEMATICS**  
**Final Examination**  
2 ½ Hours

Mathematics 115

Fall 2006

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

- 1) Write an equation of the line passing through the points  $(-4, 4)$  and  $(8, 7)$ .
- 2) Factor completely:  $2x^2y + 4xy - 16y^2$
- 3) Divide:  $\frac{2x^2 - 7x + 6}{4x^2} \div \frac{4 - x^2}{2x^2 + 4x}$
- 4) Simplify:  $\frac{1 - \frac{3}{x} - \frac{4}{x^2}}{1 - \frac{4}{x}}$
- 5) Solve for  $x$ :  $\frac{3x - 4}{y - 2x} = 5z$
- 6) Divide  $3x^3 - 2x + 5$  by  $x + 1$
- 7) Sketch the graph of  $3y - 2x = 12$ . Label the intercepts.
- 8) Given  $f(x) = 3x - 2$  and  $g(x) = 2x^2 - x + 4$ , find:
  - a)  $g(-2)$
  - b)  $g(2x)$
  - c)  $f(x+1)$
- 9) Find an equation of a line passing through  $(-4, 6)$  and is perpendicular to  $3y - 4x = 12$
- 10) Solve the following system:  $\begin{cases} 5x + 4y = 12 \\ x - 2y = 8 \end{cases}$
- 11) Given  $f(x) = 2x - 8$  and  $g(x) = \sqrt{3x + 6}$ 
  - a) Find the domain of  $f(x)$  and the domain of  $g(x)$
  - b) Find the domain of  $\frac{g(x)}{f(x)}$
- 12) Combine:  $\frac{4}{x-2} - \frac{1}{x+2} - \frac{x}{x^2-4}$

14) Evaluate:  $16^{\frac{1}{4}} - 4(5-3)^0 + 9^{\frac{3}{2}}$

15) Simplify:  $6x\sqrt{12x^3y^4} - 4\sqrt{27x^5y^4} + xy^2\sqrt{48x^3}$

16) Solve for  $x$ :  $3x^3 - 25x = 0$

17) Simplify:  $(\sqrt{x-3})^2 - (\sqrt{x} - \sqrt{3})^2$

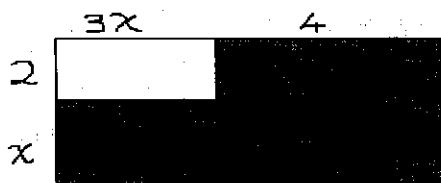
18) Given  $f(x) = x^2 - 3x + 2$  and  $g(x) = 2x^2 + x + 6$ , subtract  $f(x)$  from  $g(x)$

19) Solve for  $x$ :  $\frac{4}{x-2} - \frac{2}{x+2} = \frac{-x}{x^2-4}$

20) Rationalize each denominator and simplify:  $\frac{16}{\sqrt{5}+1} - \frac{15}{\sqrt{5}}$

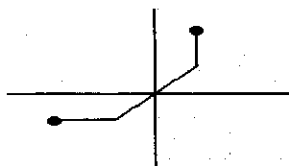
21) Solve for  $x$ :  $2 + \sqrt{3x-3} = x+1$

22) Express the shaded area as a function of  $x$ :



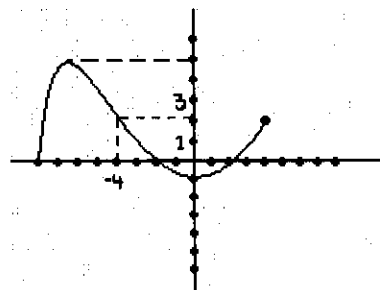
23) Determine whether each of the following is a function and why

a)



b)  $\{(2, 4), (-2, 4), (4, 2)\}$

24) Use the graph of  $y = f(x)$  to find:



- the domain of  $f$
- the range of  $f$
- $f(0) + f(-4)$
- the values of  $x$  for which  $f(x) = 0$

25) An internet service provider charges a monthly fee of \$21 plus an initial installation fee of \$50.

- Create a mathematical model that describes these charges. Represent the variables.
- Use this model to determine the number of months a person is a member of this service if this person has paid a total of \$386.