

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

Mathematics 115

Spring 2008

**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 (2, -1) and (6, 1).
- 2) Factor completely:  $3x^2y + 9xy - 54y$
- 3) Divide:  $\frac{25 - x^2}{5x^2 + 25} \div \frac{2x^2 - 15x + 25}{25x^2}$
- 4) Simplify:  $\frac{1 + \frac{3}{x} - \frac{10}{x^2}}{1 - \frac{5}{x}}$
- 5) Solve for x:  $\frac{x+1}{y-5x} = 3z$
- 6) Divide  $2x^3 - 9x + 6$  by  $(x-2)$ .
- 7) Sketch the graph of  $5x + 3y = -30$ . Label the intercepts.
- 8) Given  $f(x) = 2x^2 - 3$  and  $g(x) = 3x^2 - x + 2$ :
  - a) Find  $g(-1)$ .
  - b) Find  $f(3x)$ .
  - c) Subtract  $f(x)$  from  $f(x+1)$ .
- 9) Find an equation of a line passing through  $(-10, 8)$  and perpendicular to  $2y - 5x = 6$ .
- 10) Solve the following system:  $\begin{cases} 2x - 3y = -18 \\ 10x + 6y = -6 \end{cases}$
- 11) Given  $f(x) = 6x - 18$  and  $g(x) = \sqrt{2x + 8}$ :
  - a) Find the domain of  $f$  and the domain of  $g$ .
  - b) Find the domain of  $\frac{g}{f}$ .
- 12) Combine:  $\frac{4}{x+2} - \frac{2}{x-2} + \frac{2x}{x^2-4}$
- 13) Simplify and write with positive exponents only:  $\frac{(x^2y^6)^{\frac{2}{3}}}{(2xy)^3(8xy^3)^{-\frac{2}{3}}}$
- 14) Evaluate:  $32^{\frac{2}{5}} - 2(7-5)^0 + 16^{\frac{1}{4}}$

(Continued on other side)

15) Solve for  $x$ :  $x^2 = 4x - 2$

16) Simplify:  $3x\sqrt{72x^4y^7} + x^2y^3\sqrt{18x^2y} - 2\sqrt{162x^6y^7}$

17) Solve for  $x$ :  $3x^3 - 36x = 0$

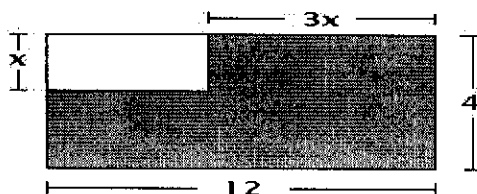
18) Simplify:  $(2\sqrt{x-2})^2 - (2\sqrt{x-2})^2$

19) Solve for  $x$ :  $\frac{5}{x-3} - \frac{2}{x+3} = \frac{x+9}{x^2-9}$

20) Rationalize each denominator and simplify:  $\frac{6}{\sqrt{3}-1} - \frac{9}{\sqrt{3}}$

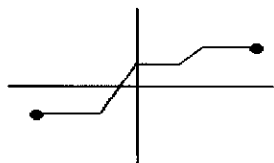
21) Solve for  $x$ :  $4 + \sqrt{5x+10} = x + 6$

22) Express the shaded area as a function of  $x$  and find the value(s) of  $x$  if this area is  $36\text{ft}^2$ :



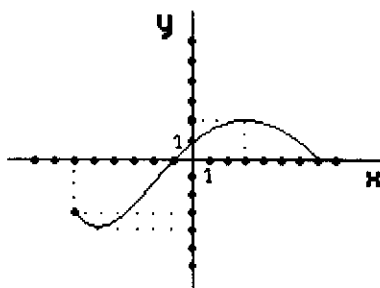
23) Determine whether each of the following is a function and justify your conclusion:

a)



b)  $\{(3, 5), (3, -5), (5, 3)\}$

24) The graph of  $y = f(x)$  is shown at the right.



Using the graph, find

- the domain of  $f$ .
- the range of  $f$ .
- $2f(0) + f(3)$ .
- the values of  $x$  for which  $f(x) = 0$ .

25) Online Music Store A charges a monthly subscription fee of \$14.10 and  $3\text{¢}/\text{song}$  while Online Music Store B charges a monthly subscription fee of \$12 and  $10\text{¢}/\text{song}$ .

- Write an expression for the cost of downloading  $x$  songs from Online Music Store A.
- Write an expression for the cost of downloading  $x$  songs from Online Music Store B.
- For what value of  $x$  would the cost be the same in both stores?