

QUEENS COLLEGE
DEPARTMENT OF MATHEMATICS

Final Examination
2 ½ Hours

Mathematics 115

Fall 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) Sketch the graph of $3x - 7y = 21$. Label the intercepts.

2) Divide: $\frac{x^2 - x - 12}{6x^3 - 9x^2} \div \frac{16 - x^2}{2x^2 + 5x - 12}$

3) Solve for x : $\frac{2}{x-4} - \frac{4}{x+4} = \frac{6x}{x^2 - 16}$

4) Evaluate: $16^{3/4} - 4(5-2)^0 + 2^{-3}$

5) Combine: $\frac{2}{x-3} - \frac{5}{x+3} - \frac{4x}{x^2-9}$

6) Write an equation of the line passing through $(6, -1)$ and $(-6, 3)$

7) Solve for x : $\frac{x+3}{x-y} = 2w$

8) Simplify: $(\sqrt{x-6})^2 - (\sqrt{x} - \sqrt{6})^2$

9) Given $f(x) = 2x + 5$ and $g(x) = x^2 - 3x + 8$ find:

a) $g(-2)$

b) $g(a) - g(-2)$

c) $f(x-3)$

10) Write an equation of the line that passes through $(8, -3)$ and is perpendicular to the line $3y - 4x = 6$.

11) Given $f(x) = -2x^2 - 5x + 9$ and $g(x) = 3x^2 - 8x + 1$, subtract $f(x)$ from $g(x)$

12) Solve for x : $2x(x-2) = 3$

13) Let $f(x) = \sqrt{3x-6}$ and $g(x) = 2x-5$

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

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

14) Simplify and write with positive exponents only:

$$\frac{(2x^3 y^{-2})^{-3} (3x^6 y^4)}{(x^8 y^{-12})^{1/4}}$$

(over)

15) Rationalize each denominator and simplify:

$$\frac{8}{3+\sqrt{5}} - \frac{20}{\sqrt{5}}$$

16) Solve for x : $\sqrt{x-3} + 1 = x - 4$.

17) Simplify: $2x\sqrt{27x^3y^4} - 3y\sqrt{75x^5y^2} + xy^2\sqrt{12x^3}$.

18) Simplify: $\frac{1 - \frac{2}{x}}{1 - \frac{3}{x} + \frac{2}{x^2}}$

19) Solve the following system:

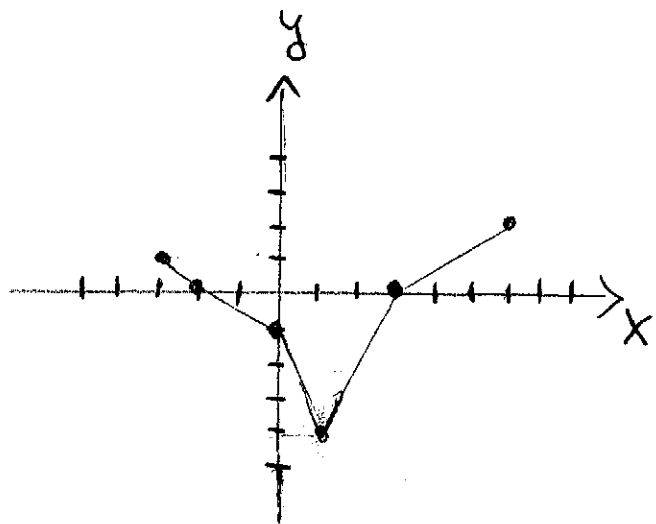
$$\begin{cases} 2x - 3y = 8 \\ 5x + 4y = -3 \end{cases}$$

20) Divide $2x^3 - 6x + 3$ by $x - 2$.

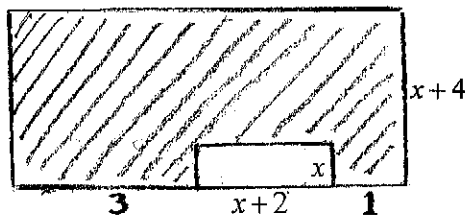
21) Solve for x : $x^3 - 8x = 0$

22) Use the graph of $y = f(x)$ shown to the right to find:

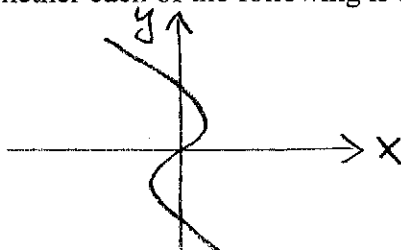
- a) the domain of $f(x)$
- b) the range of $f(x)$
- c) $f(0) + f(1)$
- d) the values of x for which $f(x) = 0$



23) Express the shaded area as a function of x :



24) Determine whether each of the following is a function and in each case explain your answer:

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

25) A cell phone company offers a plan with a monthly service charge of \$30 and a charge of \$.20 per minute.

- a) Create a mathematical model to describe this offer. Represent the variables.
- b) Find the number of minutes spent if the phone bill for a month was \$56.