

**QUEENS COLLEGE
DEPARTMENT OF MATHEMATICS**

Final Examination

$2\frac{1}{2}$ Hours

Mathematics 115

Fall 2018

Instructions: 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. Given two points $P(4, -4)$ and $Q(2, 4)$.
 - a) Find the midpoint of segment PQ .
 - b) Find the length of segment PQ .
 - c) Find an equation of the line perpendicular to PQ passing through its midpoint.

2. Factor completely:
 - a) $14xy^3 - 49xy^2 + 21xy$
 - b) $5pq^3 - 20p^3q$

3. Divide: $\frac{2x^2 - 4x}{x^2 + x - 6} \div \frac{2x^2}{x^2 - 4}$

4. Combine: $\frac{3 - x}{x^2 + 7x + 12} + \frac{x - 5}{x + 4}$

5. Solve for x :
 - a) $\frac{2x + 5}{x^2 + 4x - 5} + \frac{x - 3}{x - 1} = \frac{x}{x + 5}$
 - b) $10x = 5x^2$
 - c) $3 + \sqrt{5 - x} = x - 2$
 - d) $x^2 - 6x = 5$

6. Solve the following system: $\begin{cases} 3x - 5y = 21 \\ 2x + 3y = -5 \end{cases}$

7. Evaluate: $9^{-1/2} + 3(5 - 87)^0 - 27^{2/3}$

8. Simplify: $(\sqrt{3x - 5})^2 + (\sqrt{3x} - 5)^2$

9. Simplify: $xy^2\sqrt{12x^3y} - 5\sqrt{3x^5y^5} - 8x^2y\sqrt{27xy^3}$

10. Rationalize each denominator and simplify: $\frac{6}{\sqrt{7} + 2} - \frac{14}{\sqrt{7}}$

11. Sketch the graph of: $5x - 2y = 10$ and label the intercepts.

12.
 - a) Find an equation of the circle whose center is $(4, -5)$ and whose radius is 6.
 - b) For the parabola whose equation is $y = x^2 - 8x + 7$, find an equation of its axis of symmetry, the coordinates of its vertex, and its x and y intercepts.

13. Use long division to find the quotient and remainder: $(3x^3 - x + 18) \div (x + 2)$

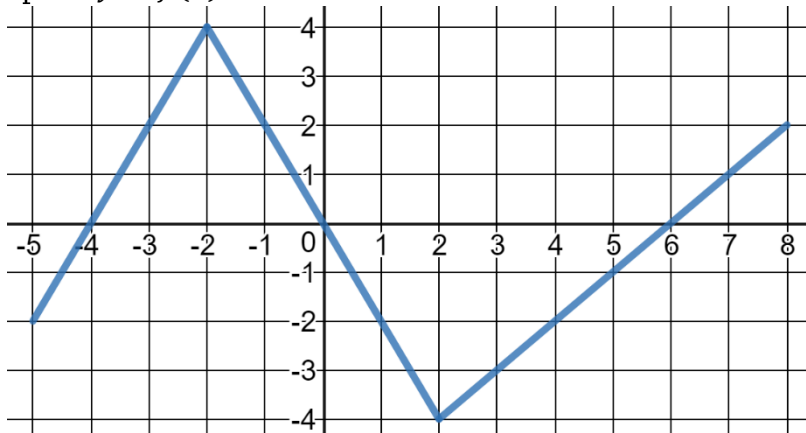
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14. Simplify: $\frac{4 - \frac{16}{x}}{1 - \frac{2}{x} - \frac{8}{x^2}}$

15. If $f(x) = 2 - 5x$ and $g(x) = 3x^2 - 4x + 2$, find:

- a) $f(-2)$
- b) $f(2a)$
- c) $g(-2)$
- d) $g(x - 1)$

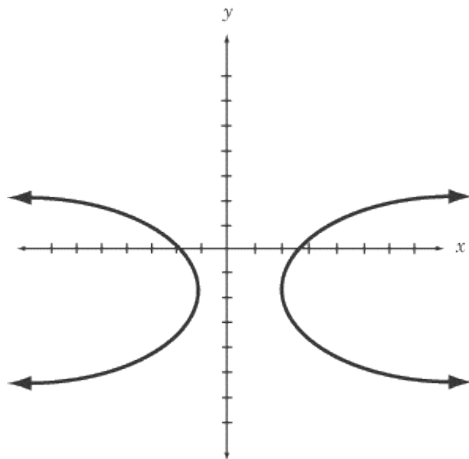
16. The graph of $y = f(x)$ is shown below.



- Find:
- a) the domain of $f(x)$
 - b) the range of $f(x)$
 - c) the values of x where $f(x) = 2$
 - d) $f(0)$

17. Determine whether each of the following relations is a function. Explain your answers!

- a) $\{(1,2), (3,5), (5,7), (7,9)\}$
- b)



18. If $f(x) = \sqrt{2x - 3}$, $g(x) = \frac{1}{\sqrt{2x - 3}}$, $h(x) = 3x^2 - 2x + 7$, find the domains of $f(x)$, $g(x)$ and $h(x)$.

19. Simplify: $\frac{(2x^{-3}y^2)^{-3}(4x^4y^{-6})^{-1/2}}{(x^{-9}y^6)^{-1/3}}$

20. An employer took 60 of his staff to a baseball game. Box seats cost \$25 each and grandstand seats cost \$10 each. He paid \$1005 for all 60 tickets. How many of each kind did he buy?

GOOD LUCK !!