

**QUEENS COLLEGE
DEPARTMENT OF MATHEMATICS**

Final Examination

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

Mathematics 115

Fall 2017

Instructions: Answer all the questions. 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) Find the length of the line segment connecting $(-2, 1)$ and $(1, -3)$.
- 2) Factor completely: $10x^3y - 35x^2y + 15xy$
- 3) Divide: $\frac{3x^3 - 12x^2}{x^2 + x - 6} \div \frac{9x}{x^2 - x - 12}$
- 4) Simplify: $\frac{7 + \frac{42}{x}}{1 + \frac{9}{x} + \frac{18}{x^2}}$
- 5) Divide: $(2x^3 - 5x + 1) \div (x - 1)$. (Use long division)
- 6) Given $f(x) = 3x - 2$ and $g(x) = x^2 - 4x + 3$, find
 - a) $f(3x) - f(0)$
 - b) $g(x - 2)$
 - c) any and all x that make $g(x) = 0$
- 7) Write an equation of the line passing through $(0, -4)$ that is perpendicular to the line passing through $(-2, 1)$ and $(1, -3)$.
- 8) Solve the system:
$$\begin{cases} 5x - 3y = 37 \\ 3x + 2y = 7 \end{cases}$$
- 9) Combine: $\frac{2}{4 - x} - \frac{10x}{16 - x^2} - \frac{5}{4 + x}$
- 10) Simplify: $\frac{(3xy)^{-2}(9x^2y^3)^{1/2}}{(x^4y^{-2})^{-1/2}}$
- 11) Evaluate: $8^{4/3} - 2(3 + 5)^0 - 4^{-2}$
- 12) Rationalize and simplify: $\frac{6}{2 - \sqrt{7}}$

(continued on other side)

13) Solve for x : $x^2 - 8x = 5$

14) Simplify: $x^2\sqrt{28x^2y^9} - 4xy\sqrt{63x^4y^7}$

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

16) Solve for x : $\frac{3}{x + 2} + \frac{5}{1 - x} = \frac{7}{x^2 + x - 2}$

17) Solve for n : $\sqrt{5n + 4} + 1 = n - 1$

18) Find the coordinates of the vertex of the parabola whose equation is $y = x^2 - 6x + 5$.

19) Write an equation of the circle centered at $(-5, 0)$ with a radius length of 4 units.

20) a) Determine the domain of $y = \frac{\sqrt{2x - 3}}{x^2 - 9}$.

b) Using the graph of $y = f(x)$ shown below, find the range of $y = f(x)$.

