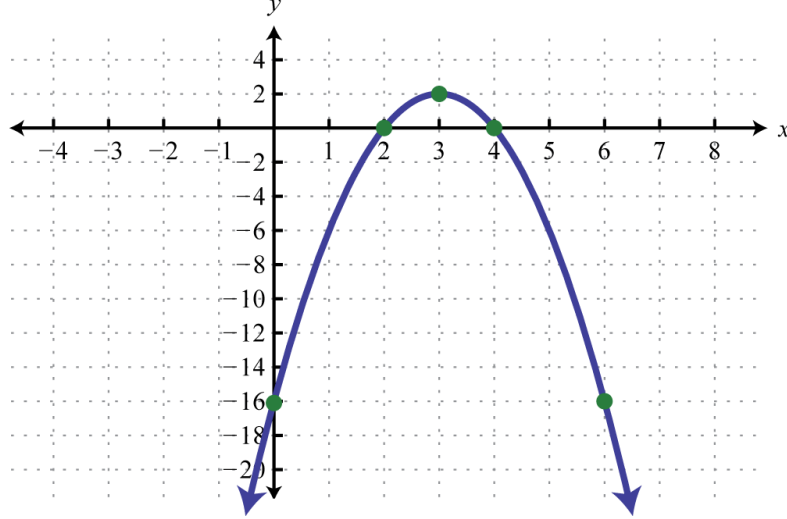


QUEENS COLLEGE
MATHEMATICS DEPARTMENT
MATH 115 FINAL EXAM FALL 2016
2 ½ HOURS

INSTRUCTIONS: ANSWER ALL QUESTIONS IN THE BLUE BOOKLET. SHOW ALL WORK FOR FULL CREDIT. PROVIDE ALGEBRAIC SOLUTIONS AND SIMPLIFICATIONS. ALL ANSWERS SHOULD BE IN SIMPLEST FORM.

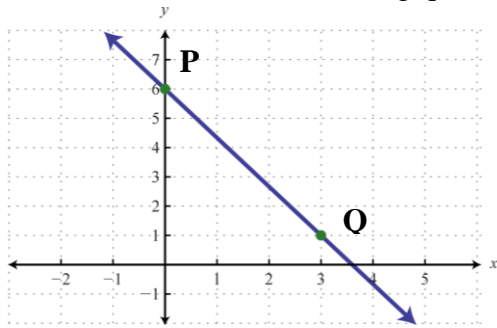
1. The graph of $y = f(x)$ is shown below. Use it to answer questions a. – d.



- a. What is the domain of $f(x)$?
 - b. What is the range of $f(x)$?
 - c. What is $f(3)$?
 - d. For what value(s) of x is $f(x) = 0$?
2. **TRUE or FALSE.** If the statement is true, then write TRUE. If the statement is false, then write FALSE and give a numerical example show that it is false.
- a. $\sqrt{x^2 + y^2} = x + y$
 - b. $\frac{a+1}{b+1} \neq \frac{a}{b}$
 - c. $(x - y)^2 = x^2 - y^2$
 - d. To solve the equation $x^2 = 2x$, divide both sides of the equation by x to get $x = 2$ only.
 - e. $f(x) = 2x^2 + 3x - 1$ is a prime polynomial.
3. Rewrite the following radical expression using a rational exponent: $\sqrt[3]{x^2}$
4. Write an equation of the circle which is centered at the origin and whose radius has length 1.
5. Multiply the radical expression by its conjugate and simplify: $3 + \sqrt{x}$
6. Expand and simplify $(x - 1)^3$.
7. Use long division to divide $27x^3 - 1$ by $3x - 1$.
8. Sketch the graph of the equation $2x - 4y = 10$. Label the x- and y-intercepts.

(continued on the other side)

9. Use the graph below to answer the following questions. The points P and Q are shown.



- What is the length of the segment \overline{PQ} ?
- What is the midpoint of the segment \overline{PQ} ?
- Write an equation of the line that passes through points P and Q, shown above.
- Determine whether the line above is perpendicular to $-3x + 5y = 25$. Explain your answer.

10. Solve for x : $x^2 - 4x + 9 = -x^2 + 7x - 4$

11. Determine the domain of the following functions.

a. $y = \frac{3x - 7}{x^2 + 2x - 3}$

b. $f(x) = 3x^2 + 3x - 6$

c. $y = \sqrt{2 - x}$

12. Simplify the following expressions.

a. $(8x^9y^6)^{\frac{1}{3}}$

b. $\frac{24x^3 + 16x^2 - 4x}{4x}$

c. $\frac{1}{x+2} - \frac{1}{2}$

d. $\frac{-12 - 7x - x^2}{x^3 + 4x^2 - 9x - 36}$

e. $5\sqrt{98x^2y^5} - 3x\sqrt{32y^5}$

13. Solve the following equations.

a. $\frac{5x - 16}{x^2 - 9} = 0$

b. $4(x - 9)^2 - 20 = 124$

c. $\sqrt{x^2 - 4} = x - 2$

14. Two car rental agencies advertise a weekend rate in the newspaper. U-rent advertised a weekend rate of \$29 plus 15 cents per mile driven. Car Galaxy advertised a weekend rate of \$40 plus 10 cents per mile driven.

- Use a system of equations to find the number of miles that will result in the same charges from both companies.
- If you plan to drive less than 200 miles, which company should you rent from?