QUEENS COLLEGE
DEPARTMENT OF MATHEMATICS

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

Mathematics 115 **Spring 2018**

Instructions: Answer all the questions. Show all work.

1) Given two points $P(2,-3)$ and $Q(3,5)$.
   a) Find the slope of $\overline{PQ}$.
   b) Find the length of segment $\overline{PQ}$.
   c) Find the midpoint of segment $\overline{PQ}$.
   d) Write an equation of the line passing through $(9,-1)$ and is perpendicular to $\overline{PQ}$.
   e) Write an equation of a circle with center Q and has a radius of 7.

2) Sketch the graphs of each of the following equations. Label all coordinates of its intercepts, center and radius, where applicable.
   a) $(x+8)^2+(y-3)^2=25$
   b) $2y-7x=5$

3) Solve the following system of linear equations: $\begin{cases} 4x+5y=0 \\ 2x+3y=-2 \end{cases}$

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

5) Factor completely:
   a) $3a^3b-3ab^3$
   b) $16x^2-20x+6$
   c) $6ax+15a-2bx-5b$

6) Simplify:
   a) $\dfrac{1-\frac{5}{y}}{y+3-\frac{40}{y}}$
   b) $\sqrt{20x^9y^8}+2xy\sqrt{5x^7y^6}$
   c) $\left(\sqrt{a-2}\right)^2-\left(\sqrt{a}-2\right)^2$
   d) $\dfrac{\left(3^{1/2}x\right)^{-2}(2xy^{-1})^0}{(2^{-1/2}x^{-2}y^3)^{-2}}$
   e) $5\sqrt{2}-8\sqrt{3}-\left(\sqrt{2}-7\sqrt{3}\right)$

7) Evaluate:
   $\left(-\frac{1}{32}\right)^{-4/5}$

8) Rationalize and simplify: $\dfrac{10}{\sqrt{5}+1}$

(continued on the back)

9) Solve each of the given equations for x:

a) $\sqrt{2x-7}-5=4$

b) $\dfrac{5}{x+3}-\dfrac{4}{3x}=\dfrac{7}{x^2+3x}$

c) $x(x-2)=-1$

d) $x^2+8x-4=0$

10) Divide: $\dfrac{x^2-3x+2}{4x-8}\div\dfrac{(x^3-x^2)}{8x}$

11) Given $f(x)=3x^2+2x-1$, $g(x)=\frac{5}{\sqrt{x-1}}$, $h(x)=\sqrt{2x+5}$, $J(x)=7x^2-2+x$, find

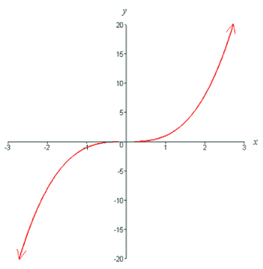
a) $g(5)$
b) $h(2)$
c) $f(a+1)$
d) the domain of $g(x)$
e) the domain of $h(x)$
f) the difference when $J(x)$ is subtracted from $f(x)$
g) $-2\big(f(x)\big)+3\big(J(x)\big)$

12) Find the vertex, axis of symmetry, x-intercepts, and y-intercept of the function $f(x)=3x^2+2x-8$.

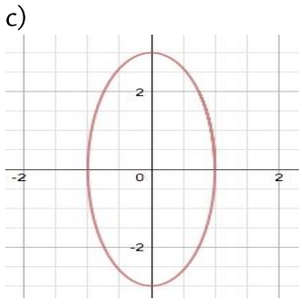
13) Determine whether each of the following relations is a function. Explain your reasoning.

a) $\{(2,6),(2,-1),(3,5),(4,7)\}$

b)



c)



14) A TV repairman charges \$15 to fix a television and \$10 to fix a radio. Yesterday he fixed a total of twenty-three radios and televisions. If he collected \$295, how many of each did he fix?

15) Use the graph of $y=f(x)$ to find:

a) the domain of $f(x)$.
b) the range of $f(x)$.
c) the value(s) of x for which $f(x)=0$.
d) $f(0)$.