

MATH 71 Exam Review
Solutions to all problems will be on the answer key

Question 1 Simplify all of the following:

a) $\left(\frac{3x^2y^{-7}}{5y^{-3}}\right)^3$

c) $\sqrt{50a^5bc^2}$

e) $\sqrt[3]{x} \sqrt[5]{x^2}$

g) $2\sqrt[3]{x^5y^2} + 8x\sqrt[3]{27x^2y^2}$

i) $(8 - 5i)^2$

k) $\frac{\frac{2x}{x+1} - \frac{3}{x-1}}{\frac{2}{x-1} + \frac{x}{x+1}}$

m) $\frac{x^2 - 7x + 12}{x^2 - 81} \div \frac{x^2 - 2x - 8}{x^2 - 18x + 81}$

o) $\frac{6}{y+2} - \frac{4}{y-5} + \frac{y^2 - 8}{y^2 - 3y - 10}$

q) $\left(16x^{\frac{4}{5}}\right)^{\frac{3}{4}}$

s) $\frac{\sqrt{7}}{\sqrt{3} - \sqrt{2}}$

b) $\frac{(2x^{-3}y^9)^{-3}}{x^{-2}y^3}$

d) $\sqrt[3]{6x^7} \sqrt[3]{18x^4}$

f) $2\sqrt{125xy^2} - 3y\sqrt{45x}$

h) $(\sqrt{20} + 4\sqrt{5})(\sqrt{20} - 3\sqrt{5})$

j) $\frac{5+i}{3-2i}$

l) $\frac{\frac{5}{a} + \frac{3}{b}}{\frac{4}{a} - \frac{2}{b}}$

n) $\frac{\sqrt[4]{48a^9b^{13}}}{\sqrt[4]{3ab^{-3}}}$

p) $\frac{x^{-2} - y^{-2}}{4x^{-1} - 4y^{-1}}$

r) $\left(32x^{\frac{7}{15}}\right)\left(x^{\frac{3}{5}}\right)$

t) $\sqrt{\frac{8}{5x}}$

Question 2 Factor completely:

a) $24a^7b - 81ab^7$

c) $y^2 - 8y + 16 - 81x^2$

e) $x^4 - 81$

g) $x^5 - 9x^3 - x^2 + 9$

i) $8x^6 + 64y^{15}$

b) $24x^2 - 7x - 5$

d) $2ab + bc - 2ad - dc$

f) $x^2 - 8x + 12$

h) $x^2(x - 9) + 25(9 - x)$

j) $18x^2y + 3xy - 105y$

Question 3 Solve:

a) $\frac{2}{x+3} - \frac{3x+5}{x^2+4x+3} = \frac{5}{x+1}$

c) $\frac{3}{x^2} = \frac{4}{x} - 2$

e) $14x^2 + 11x = 15$

g) $x^2 - 6x + 3 = 0$

i) $\left| \frac{4-x}{3} \right| \leq 6$

k) $4^x = 7$

m) $5^{2x} = 3^{x-2}$

o) $\log_2(2x+4) = 3$

b) $\frac{2}{x-4} - \frac{x+16}{x^2-3x-4} = \frac{4}{x+1}$

d) $\frac{x-2}{x+3} = \frac{x-5}{x+1}$

f) $x^4 - 5x^2 + 4 = 0$

h) $5x^2 = 10x$

j) $7 - 5|2x-3| < -8$

l) $3^{5x+1} = 81$

n) $\log x - \log(2x-1) = 2$

p) $\log_2(x+3) + \log_2(x-3) = 4$

Question 4 Divide the following:

a) $(x^5 - x^4 + 3x^2 + 298) \div (x+3)$

b) $\frac{4x^4 - 15x^2 - 4}{x-2}$

Question 5 Solve: (These are meant to be quick short answers)

a) $|2x - 4| > -2$

b) $|4 - 3x| \leq -4$

c) $|7x - 13| = -23$

d) $|2x - 4| > 0$

e) $|6 - 3x| \leq 0$

f) $|21 - 7x| = 0$

Question 6 Solve: (write solution set in interval notation)

a) $\frac{x-1}{x-2} \leq 1$

b) $\frac{x^2 - x - 2}{x - 5} > 0$

Question 7 Solve the following systems of equations:

a)
$$\begin{cases} 2x + 3y = 14 \\ x - y = 7 \end{cases}$$

b)
$$\begin{cases} 6y - 4x = -12 \\ 3y - 2x = 12 \end{cases}$$

c)
$$\begin{cases} 5x^2 + y^2 = 49 \\ 2x^2 - 3y^2 = 6 \end{cases}$$

d)
$$\begin{cases} 6x + 3y = 21 \\ y = 7 - 2x \end{cases}$$

e)
$$\begin{cases} 2x - y + z = 5 \\ x + 3y - z = -9 \\ 3x + y + 2z = 4 \end{cases}$$

f)
$$\begin{cases} 2x + y - z = 3 \\ -x + 2y + 4z = -3 \\ x - 2y - 3z = 4 \end{cases}$$

Question 8 Given Functions $f(x) = x^2 - 6x + 9$ $g(x) = 3x - 4$ $h(x) = \sqrt{x-3} + 4$ Find:

a) $(f + g)(x)$

b) $(f - g)(x)$

c) $\frac{f(x+h) - f(x)}{h}$

d) $\left(\frac{f}{g}\right)(x)$ (State the domain)

e) $(f \circ g)(x)$

f) $(fg)(x)$

g) $f(-3) \cdot h(28)$

h) $h^{-1}(x)$

Question 9 State the domain of the function using set-builder notation or interval notation where appropriate:

a) $f(x) = 2x^5 - 7x^3 + 1$

c) $f(x) = \sqrt{3x - 2}$

e) $f(x) = \frac{\sqrt{2x - 5}}{x + 3}$

b) $f(x) = \sqrt{x^2 - x - 6}$

d) $f(x) = \log(2 - 7x)$

f) $f(x) = \frac{2x - 1}{x^2 + 10x - 24}$

Question 10 Solve the formula for the specified variable:

a) $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$; Solve for R

c) $A = 3\pi(R^2 + r^2)$; Solve for r

b) $f = \frac{f_1 f_2}{f_1 + f_2}$; Solve for f_2

d) $C = \frac{5}{9}(F - 32)$; Solve for F

Question 11 Expand the following using the Binomial Theorem: $(3x - 2y)^5$

Question 12 Find the term indicated in each expansion:

a) $(2x - y)^{11}$; 8^{th} term

b) $(x - 2y)^{11}$; 6^{th} term

Question 13 Evaluate the given binomial coefficient:

c) $\binom{99}{97}$

d) $\binom{15}{8}$

Question 14 Simplify:

e) $\frac{(n-1)!}{n!}$

f) $\frac{(n+3)!}{(n+1)!}$

Question 15 Express each sum using summation notation and use k for the index of summation:

g) $1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \frac{1}{25}$

h) $2 + 5 + 8 + 11 + \dots + 59$

Question 16 If $a_n = \frac{2n-1}{2n+1}$, then find the following:

i) $a_1 =$

j) $a_3 =$

k) $a_{11} =$

l) $a_{21} =$

Question 17 Evaluate each sum:

m) $\sum_{k=2}^5 (k^2 + 1)$

n) $\sum_{k=0}^5 \sqrt{k^2 + 2k + 1}$

o) $\sum_{k=0}^3 (3^k - 1)$

p) $\sum_{k=1}^4 3\left(-\frac{3}{2}\right)^{k-1}$

Question 18 Find the following for the quadratic functions then sketch the graph:

(a) Coordinate of the vertex.

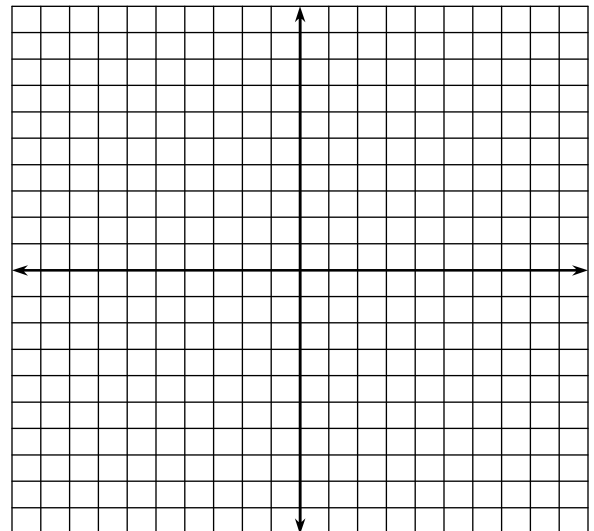
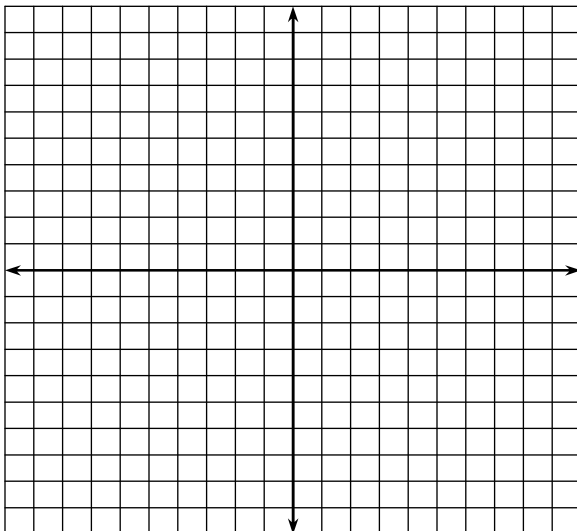
b) Equation of the axis of symmetry.

(c) x-intercepts.

d) y-intercept.

I. Given: $f(x) = -x^2 + 4x - 3$

II. Given: $f(x) = 2(x - 3)^2 - 8$



Question 19 For the following:

i) Write the equation in standard form.

ii) Graph the equation labeling the important components.

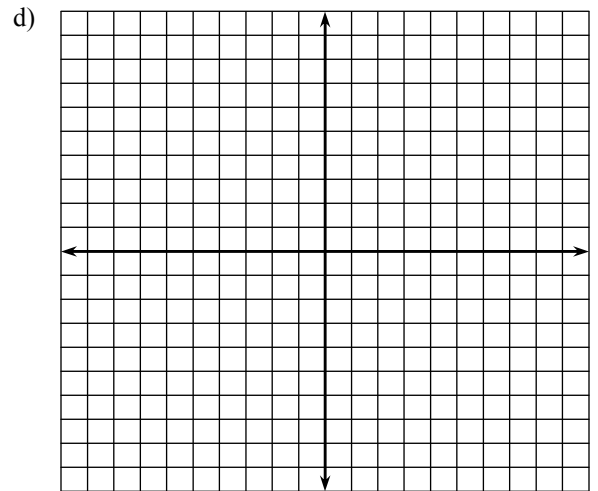
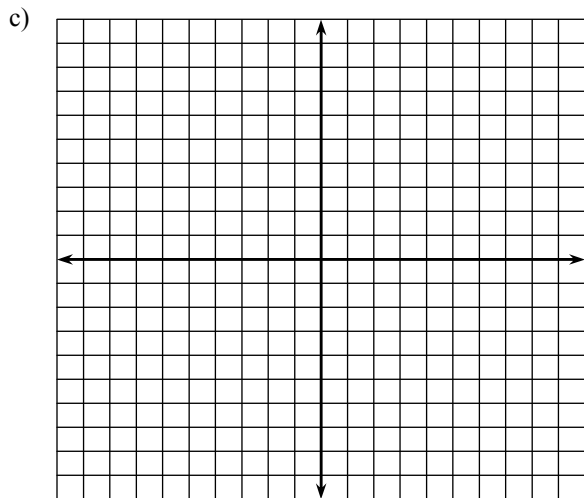
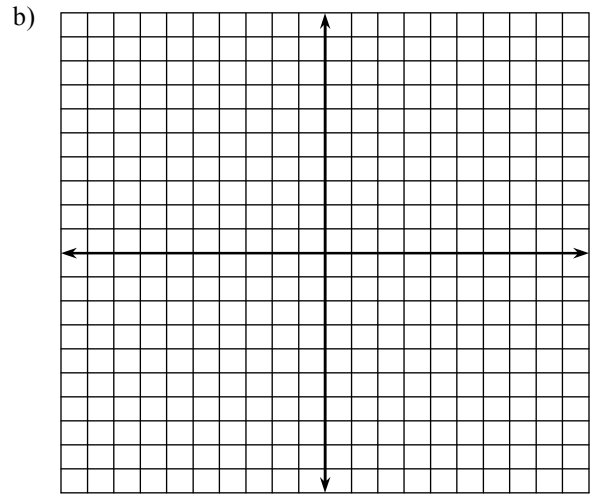
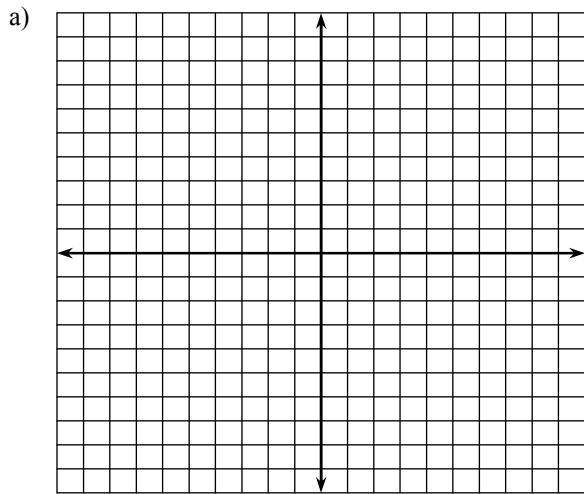
iii) Classify the equations as a circle, ellipse, parabola or hyperbola.

(a) $x^2 + y^2 - 6x - 4y + 9 = 0$

(b) $25x^2 - 16y^2 = 400$

(c) $4x^2 = 36 - 9y^2$

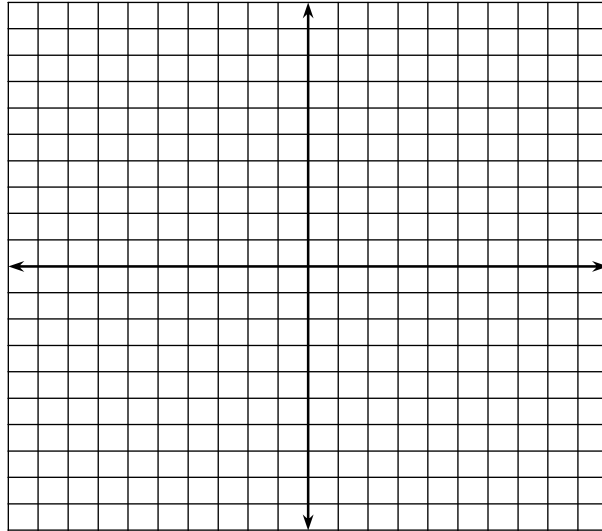
(d) $x - 4y = y^2 - 1$



Question 20 Graph each function on the same set of axis using the table to obtain points. Label the intercepts and asymptotes:

Given: $y_1 = 2^x$ and $y_2 = \log_2 x$

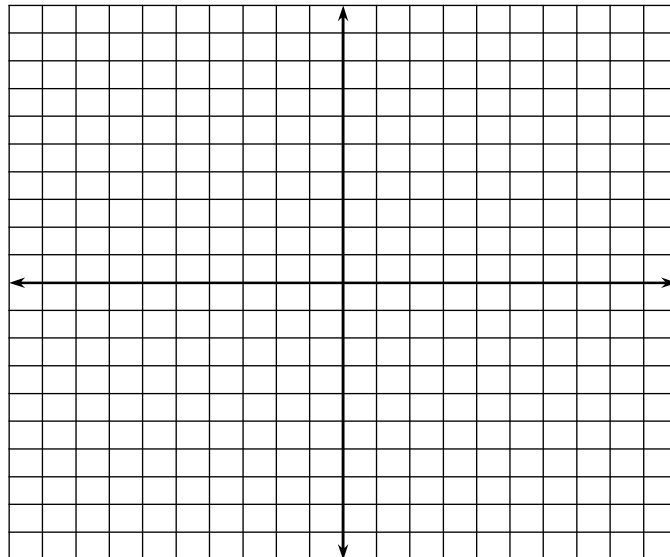
x	y_1
-2	
-1	
0	
1	
2	



x	y_2

Question 21 Solve the system of inequalities and shade the solution on the graph:

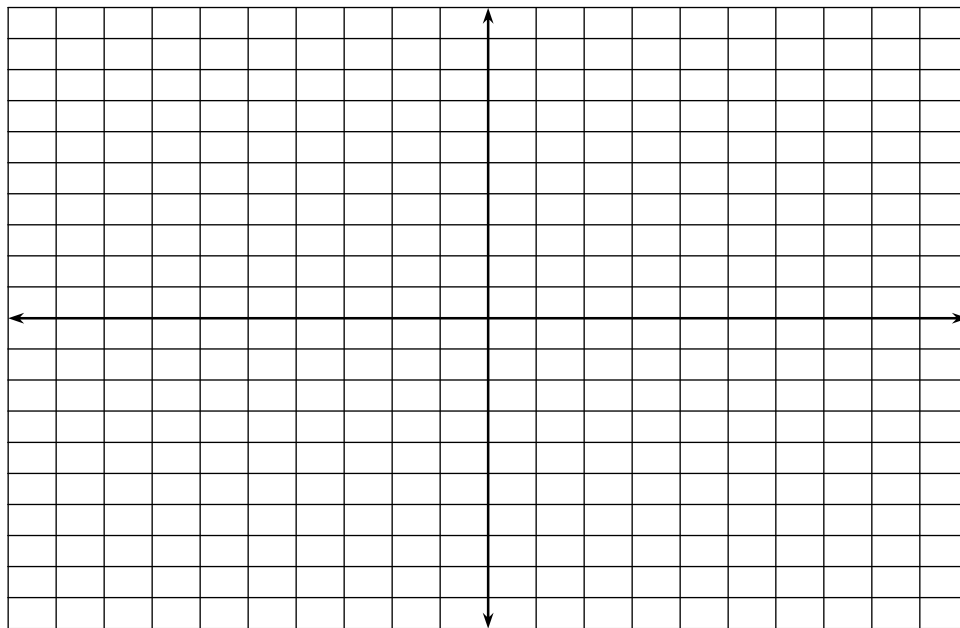
$$\begin{cases} 2x + 3y < 14 \\ x - y \geq 7 \end{cases}$$



Question 22 Find the equation of the line in slope-intercept form given the following conditions and graph lines below:

a) Through the two points $(-4, -5)$ $(6, 2)$

b) Slope $m = -5$ and through $(-2, 8)$



Question 23 Find the equation of the line in slope-intercept form given the following conditions and graph lines below:

a) Through $(-3, -5)$ and parallel to $2y - x = -2$

b) Through $(5, -6)$ and perpendicular to $5x - 7y = 21$

