

# Math 117 Final Exam Review Problems

These problems are intended to help you prepare for the test. Test problems will look similar to, but not the same as, some of the problems below.

**This list of problems is not all inclusive and does not represent every possible type of problem.** It is suggested that you review lectures, past exams, classwork problems, and homework problems in addition to this review.

(1) Consider the general equation of a circle  $x^2 + y^2 + 16x - 2y + 64 = 0$ .

- (a) Write the equation of the circle in standard form.
- (b) What is the radius of the circle?
- (c) Give the point that represents the center of the circle.

(2) Consider the line segment connecting the points  $(1,4)$  and  $(-3,2)$ .

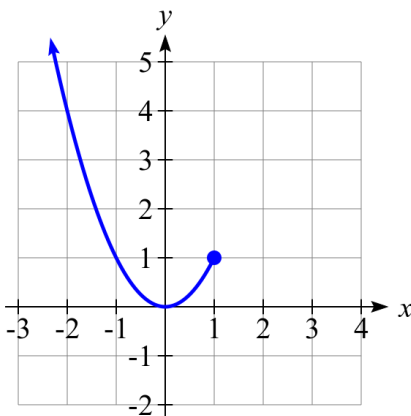
If this line segment is the diameter of a circle, what is the standard equation of the circle?

(3) Graph the equation

$$y = 2|x| - 1$$

by plotting points on the given cartesian plane below. Let  $x = -3, -2, -1, 0, 1, 2, 3$ .

(4) Consider the following graph of  $f(x)$



- (a) Is this a function?
  - (b) What is the domain?
  - (c) What is the range?
  - (d) What is  $f(1)$ ?
  - (e) For which  $x$  value does  $f(x) = 4$
  - (f) Is the function one-to-one?
- (5) For each of the following, find an equation (it can be in any form) of the line that satisfies the given properties.
- (a) The line that passes through the points  $(-1, 3)$  and  $(2, 9)$
  - (b) The line with slope  $\frac{1}{2}$  that passes through the point  $(-2, 1)$
  - (c) The line perpendicular to  $y = \frac{3}{5}x + 5$  and passes through the point  $(-3, 1)$
  - (d) The line parallel to  $y = -\frac{2}{3}x + 1$  that passes through the point  $(0, 6)$

(6) Graph the following lines.

(a)  $f(x) = -2x + 3$

(b)  $y = 3$

(c)  $x = -2$

(d)  $-3x + 4y = 8$

(7) Solve the following linear equations.

(a)  $7x - 6 = 8$

(b)  $6(x - 1) = 5x - 9$

(c)  $5x - (3x - 4) = 12$

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

(e)  $-2x + 4 = 3(x - 2) + 10$

(8) Attempt to solve the following problems, and determine whether the equation is an identity, a conditional equation, or a contradiction.

(a)  $3(x - 5) - 3x + 5 = 3$

(b)  $5x + 30 = 10(x + 3) - 5x$

(c)  $4(x + 3) = 8 + 4x$

(d)  $-5(x + 3) = x + 4(x + 3)$

(9) . Solve the following inequalities. **Write your answer in interval notation.**

(a)  $-2 + 9x + 4 \geq 8x - 10$

(b)  $-4(x - 2) > 2x - 4$

(c)  $-1 \leq \frac{-3x + 4}{2} < 8$

(d)  $\frac{2x-5}{2} < \frac{5x+1}{5}$

(10) On two examinations, you have grades of 84 and 89. There is an optional final examination, which counts as one grade. You decide to take the final in order to get a course grade of A, meaning a final average of at least 90.

(a) What must you get on the final to earn an A in the course?

(b) By taking the final, if you do poorly, you might risk the B that you have in the course based on the first two exam grades. If your final average is less than 80, you will lose your B in the course. Describe the grades on the final that will cause this to happen.

(11) Consider the following piecewise function:

$$f(x) = \begin{cases} 8 + 2x & \text{if } -3 \leq x \leq -1 \\ 5 - x & \text{if } -1 < x \leq 2 \\ x + 1 & \text{if } 2 < x \leq 5 \end{cases}$$

(a) Find  $f(-2)$ ,  $f(-1)$ ,  $f(2)$ , and  $f(3)$

(b) Sketch a graph of  $f$

(12) Find the vertex of the following quadratic functions:

(a)  $2x^2 + 4x - 5$

(b)  $x^2 + 8x - 5$

(13) Consider the function  $f(x) = -3x^2 - 6x + 11$ .

(a) Determine whether the function has a minimum or maximum value. Justify your answer.



- (23) Consider  $f(x) = x^3(4-x)^3(x+5)$
- Describe the end behavior of the graph.
  - Find the x-intercepts. State the multiplicity of each intercept and whether the graph crosses the x-axis, or touches the x-axis and turns around, at each intercept.
  - Find the y-intercept
  - Determine whether the graph has y-axis symmetry (even function), origin symmetry (odd function), or neither.
  - Graph
- (24) Solve the following equations for  $x$ :
- $6x + 7 = 3x + 40$
  - $x^2 + 11x + 30 = 0$
  - $x^2 - 2x + 4 = 0$
  - $x^4 - 11x^2 + 18 = 0$
- (25) Consider the function  $f(x) = \frac{2x^2}{x^2-4}$
- Find any intercepts
  - Find any asymptotes
  - Sketch a graph of  $f$
- (26) Consider the function  $f(x) = \frac{x^2-9}{x-4}$
- Find any intercepts
  - Find any asymptotes
  - Sketch a graph of  $f$
- (27) Evaluate the expressions by hand
- $(36^{3/4})^2$
  - $(9^{-3/2})^{-2}$
  - $(\frac{4}{9})^{-3/2}$
  - $81^{3/4}$
- (28) Solve the following equations:
- $\frac{x+5}{x-2} = \frac{x-1}{x+1}$
  - $\frac{1}{x} - \frac{1}{x^2} + 2 = 0$
  - $\frac{1}{x+1} + \frac{1}{x-2} = \frac{4}{x^2-4}$
- (29) Solve the following inequalities
- $x^3 + x^2 - 6x > 0$
  - $x^4 + 4 < 5x^2$
  - $\frac{2x-1}{x+2} > 0$
- (30) Solve the following equations.
- $x^2 + 11x + 30 = 0$
  - $x^2 = 8x - 7$
  - $2x^3 - 2x^2 - 18x + 18 = 0$
  - $x^{2/3} - 4x^{1/3} - 5 = 0$

(31) Solve the following equations for  $x$ :

(a)  $5x^{3/2} = 135$

(b)  $\sqrt{36 - 5x} = x$

(c)  $\sqrt[3]{2x - 3} + 1 = 4$

(d)  $\sqrt{x - 2} = 5 - \sqrt{x + 3}$

(32) Answer the following questions:

(a) Let  $f(x) = x - 8$  and let  $g(x) = 4x^2$ .

i. Find  $(f + g)(x)$

iii. Find  $(fg)(x)$

ii. Find  $(f - g)(x)$

iv. Find  $\left(\frac{f}{g}\right)(x)$

(b) Let  $f$  and  $g$  be defined by the following tables

$x$	-1	0	1	3
$f(x)$	3	5	7	9

$x$	-1	0	1	3
$g(x)$	-2	0	1	9

i. Find  $(f + g)(1)$

iii. Find  $(fg)(-1)$

ii. Find  $(f - g)(3)$

iv. Find  $\left(\frac{f}{g}\right)(0)$

(33) Let  $f(x) = -3x^2$  and let  $g(x) = x + 6$ .

(a) Find  $(f \circ g)(x)$

(c) Find  $(f \circ f)(x)$

(b) Find  $(g \circ f)(x)$

(d) Find  $(g \circ g)(x)$

(34) Find  $f^{-1}(x)$  for the following one-to-one functions, then check your answer using function composition:

(a)  $f(x) = \frac{9}{x} + 6$

(b)  $f(x) = \frac{3x}{x+7}$