

Math 3 Final Exam Review

Name: \_\_\_\_\_

Date: \_\_\_\_\_

1. Add:  $(8 + 4i) + (10 - 2i)$

- A.  $18 + 2i$                       B.  $18 + 6i$   
 C.  $18 - 2i$                       D.  $18 - 6i$

2. Express the product in standard form.

$$3i(6 - 2i)$$

- A.  $6 + 18i$                       B.  $-6 + 18i$   
 C.  $-6 - 18i$                       D.  $6 - 18i$

3. Express the product in standard form.

$$(4 + 2i)(7 - 6i)$$

- A.  $40 + 10i$                       B.  $40 - 10i$   
 C.  $16 + 10i$                       D.  $16 - 10i$

4. Solve:  $x^2 + 9 = 0$  over the set of complex numbers.

- A.  $\pm 9i$     B.  $3 + i$     C.  $\pm 3i$     D.  $-3$

5. Solve the equation  $x^2 - 2x = -5$  for all complex numbers.

- A.  $2 \pm 4i$     B.  $2 \pm 2i$     C.  $1 \pm 2i$     D.  $\pm 4i$

6. Solve:  $4x^2 = 5x - 6$

- A.  $\frac{5 + 7i}{4}$                       B.  $\frac{-5 \pm 4i\sqrt{6}}{2}$   
 C.  $\frac{5 \pm i\sqrt{71}}{8}$                       D.  $\frac{-5 \pm i\sqrt{71}}{2}$

7. Solve:  $3x^2 = 6 - 2x$

- A.  $\left\{ \frac{\pm\sqrt{19}}{5} \right\}$   
 B.  $\left\{ \frac{-1 + \sqrt{19}}{10}, \frac{-1 - \sqrt{19}}{10} \right\}$   
 C.  $\left\{ \frac{1 + \sqrt{19}}{3}, \frac{1 - \sqrt{19}}{3} \right\}$   
 D.  $\left\{ \frac{-1 + \sqrt{19}}{3}, \frac{-1 - \sqrt{19}}{3} \right\}$

8. According to the Fundamental Theorem of Algebra, how many roots does the following equation have?

$$3x^3 + 4 = 5x^2 - 7x$$

- A. 2                      B. 3                      C. 4                      D. 6

9. Simplify:  $(2xy^2 + 9x^2y) - (6xy^2 + 7xy)$

- A.  $-4xy^2 + 16xy$                       B.  $9x^2y - 7xy + 8xy^2$   
 C.  $9x^2y - 7xy - 4xy^2$                       D.  $9x^2y + 7xy - 4xy^2$

10. When  $4x^2 - 9y^2$  is factored completely, one of the factors will be \_\_\_\_\_.

- A.  $x + 3y$                       B.  $x - 3y$   
C.  $2x - 3y$                       D.  $4x - 3y$

11. Factor completely:  $9x^2 + 36xy + 36y^2$

- A.  $(9x + 18y)(x + 2y)$       B.  $(3x + 6y)(3x + 6y)$   
C.  $9(x^2 + 4xy + 4y^2)$       D.  $9(x + 2y)^2$

12. When factored correctly,  $x^2 - 9 =$  \_\_\_\_\_.

- A.  $(x + 3)^2$                       B.  $(x - 3)(x + 3)$   
C.  $(x + 3)^{-2}$                       D.  $(x - 9)(x + 1)$

13. Factor:  $100 - w^2$

- A.  $(w + 10)(w - 10)$   
B.  $(10 - w)(10 - w)$   
C.  $(w + 10)(w + 10)(-1)$   
D.  $(10 - w)(10 + w)$

14. Factor completely:  $3x^2 - 75$

- A.  $3(x - 5)(x - 5)$               B.  $(3x + 5)(x - 15)$   
C.  $3(x + 5)(x - 5)$               D.  $(3x - 5)(x + 15)$

15. Factor:  $x^2 - 4x - 12$

- A.  $(x + 6)(x - 2)$               B.  $(x + 2)(x - 6)$   
C.  $(x + 12)(x - 1)$               D.  $(x - 4)(x + 3)$

16. Factor:  $4x^2 - x - 3$

- A.  $(2x - 3)(2x + 1)$               B.  $(2x + 3)(2x - 1)$   
C.  $(4x - 3)(x + 1)$               D.  $(4x + 3)(x - 1)$

17. Complete the square:  $p^2 + 6p +$  \_\_\_\_\_

- A. 36              B. 4              C. 6              D. 9

18. Simplify:  $(2x^3 + 3x^2 - x - 5) - (x^3 - 2x^2 + 5x - 1)$

- A.  $x^3 + x^2 - 6x - 4$               B.  $x^3 + 5x^2 + 4x - 6$   
C.  $x^3 - 5x^2 + 4x - 6$               D.  $x^3 + 5x^2 - 6x - 4$

19. Simplify:  $-8m^6(-3m^2 + m + 3)$

- A.  $-11m^8 - 7m^7 - 5m^6$   
B.  $-11m^{12} - 7m^6 - 5m^6$   
C.  $24m^8 - 8m^7 - 24m^6$   
D.  $24m^{12} - 8m^6 - 24$

20. Simplify:  $(4y - 9)^2$

- A.  $16y^2 - 72y + 81$               B.  $16y^2 - 36y + 81$   
C.  $8y - 18$                           D.  $8y^2 + 18$

21. Find the quotient and remainder of  $(x^3 + 8x^2 + 19x + 13) \div (x - 3)$  using long division.

- A.  $(x^2 + 11x + 52)$  R 13
- B.  $(x^2 + 11x + 52)$  R 169
- C.  $(x^2 + 5x + 4)$  R 1
- D.  $(x^2 + 11x + 52)$  R -1

22. Divide:  $2a + 1 \overline{) 2a^3 + 7a^2 - 5a - 2}$

- A.  $a^2 + 3a - 4 + \frac{2}{2a + 1}$
- B.  $2a^2 - a + 3 - \frac{7}{2a + 1}$
- C.  $a^2 - 2a - 1 + \frac{3}{2a + 1}$
- D.  $2a^2 + 5a + 4 - \frac{4}{2a + 1}$

23. Find the quotient and remainder of  $(x^3 + 8x^2 + 19x + 13) \div (x - 3)$  using synthetic division.

- A.  $(x^2 + 11x + 52)$  R 13
- B.  $(x^2 + 5x + 4)$  R -1
- C.  $(x^2 + 11x + 52)$  R 169
- D.  $(x^2 + 11x + 52)$  R -1

24. Use synthetic division to divide  $2x^4 - 17x^2 - 5$  by  $x - 3$ .

- A.  $Q(x) = 2x^3 + 6x^2 + x + 3$  R 4
- B.  $Q(x) = 2x^3 + 6x^2 + x - 3$  R 4
- C.  $Q(x) = 2x^3 + 3x^2 - x + 9$  R 7
- D.  $Q(x) = x^3 + 4x^2 - 19$  R 1

25. What is the remainder when  $2x^3 - 3x^2 - 5x + 4$  is divided by  $x + 2$ ? Is  $x + 2$  a factor of the polynomial?

26. What are the  $x$ -intercepts of  $x^2 - 3x = 4$ ?

- A.  $\{-1, 4\}$
- B.  $\{1, -4\}$
- C.  $\{-1, -4\}$
- D.  $\{1, 4\}$

27. What are the zeros of the function  $f(x) = x^3 + 4x^2 + x - 6$ ?

- A. -3, -2, and 1
- B. -2, -1, and 3
- C. -1, 2, and 3
- D. 1, 2, and 3

28. Which of the following is *not* a root of the equation  $x^3 - 2x^2 - 5x + 6 = 0$ ?

- A. -2
- B. 1
- C. 3
- D. 4

29. Simplify:  $\frac{5x + 15}{x + 3}$

- A. 5                      B.  $\frac{20}{3}$   
C. 10                      D. does not simplify

30. Simplify:  $\frac{x^2 - 2x - 15}{x^2 - 8x + 15}$

- A. -2      B. -1      C.  $\frac{x - 3}{x + 3}$       D.  $\frac{x + 3}{x - 3}$

31. Multiply:  $\frac{x^2 + 3x - 10}{x^2 - 4} \cdot \frac{x + 2}{x^2 - 9}$

- A.  $\frac{5}{x - 9}$                       B.  $\frac{x + 5}{x - 9}$   
C.  $\frac{x + 5}{x^2 - 9}$                       D.  $\frac{x - 5}{x^2 + 9}$

32. Simplify:  $\frac{c^2 - c - 12}{c^2 + 4c + 3} \div \frac{c^2 - 6c + 8}{c^2 + 5c + 4}$

- A.  $\frac{c + 4}{c - 2}$       B.  $\frac{c - 4}{c - 2}$       C.  $\frac{c - 4}{c + 2}$       D.  $\frac{c + 4}{c + 2}$

33. Simplify:  $\frac{x}{x - 4} - \frac{6x}{x - 5}$

- A.  $\frac{5x^2 - 9x + 20}{(x - 4)(x - 5)}$                       B.  $\frac{-5x^2 + 19x}{(x - 4)(x - 5)}$   
C.  $\frac{-7x^2 + 5x - 24}{(x - 4)(x - 5)}$                       D.  $\frac{5x^2 - 5x + 24}{(x - 4)(x - 5)}$

34. Write the constraints and objective function for the following problem.

A manufacturer makes two kinds of computers, laptops and desktops. The company has equipment to manufacture any number of laptops up to 600 per month or any number of desktops up to 800 per month. However, the company can manufacture at most 1,000 computers of both kinds per month in all. It takes 35 man-hours to manufacture either type of computer and the manufacturer has available 25,000 man-hours per month.

If the manufacturer earns a profit of \$155.00 on each laptop and \$96.00 on each desktop, find the number of each type computer the company should manufacture to earn the greatest profit. (Let  $x$  represent the number of laptops and let  $y$  represent the number of desktops.)

- |    |                         |    |                         |    |                         |    |                         |
|----|-------------------------|----|-------------------------|----|-------------------------|----|-------------------------|
| A. | $P(x, y) = 96x + 155y$  | B. | $P(x, y) = 155x + 96y$  | C. | $P(x, y) = 155x + 96y$  | D. | $P(x, y) = 96x + 155y$  |
|    | $0 \leq x \leq 600$     |    | $0 \leq x \leq 600$     |    | $0 \leq x \leq 600$     |    | $0 \leq x \leq 600$     |
|    | $0 \leq y \leq 800$     |    | $0 \leq y \leq 800$     |    | $0 \leq y \leq 800$     |    | $0 \leq y \leq 800$     |
|    | $x + y \leq 1000$       |    | $x + y \leq 1000$       |    | $x + y \geq 1000$       |    | $x + y \leq 1000$       |
|    | $35x + 35y \geq 25,000$ |    | $35x + 35y \leq 25,000$ |    | $35x + 35y \geq 25,000$ |    | $35x + 35y \leq 25,000$ |

35. Find all real solutions of  $\sqrt{x-1} + x = 7$

- A. 10 only                      B. -10 only  
 C. both 5 and 10              D. 5 only

36. Consider solving  $x^2 + -5x - 20 = 0$  by completing the square.

$$x^2 + -5x + \underline{\hspace{1cm}} = 20 + \underline{\hspace{1cm}}$$

What is the number that goes in the blanks?

- A.  $-\frac{25}{4}$     B.  $\frac{5}{2}$     C.  $\frac{25}{4}$     D.  $\frac{25}{2}$

37. Put the following in vertex form:  $a(x-h)^2 + k$ .

- a)  $y = 2x^2 - 24x + 69$   
 b)  $y = -x^2 + 6x - 8$

38. Given the function  $y = -x^3 + 3x^2 - 3x$ .

- a) Find the zeroes.  
 b) Find the critical points (relative min/max, absolute min/max).  
 c) Find where the function is increasing and where it is decreasing.  
 d) Sketch the function.

39. Given the equation  $y = x^2 + 2x - 24$ :

- a) Use a graphing calculator to find the  $x$ -intercepts.  
 b) Solve the equation  $x^2 + 2x - 24 = 0$  by factoring.  
 c) Explain how the above answers are related.

40. If  $f(x) = 2x + 1$  and  $g(x) = x^2 + 2x + 1$ , find  $f(g(x))$ .

- A.  $x^2 + 2x + 3$                       B.  $2x^2 + 4x + 3$   
 C.  $4x^2 + 2x + 2$                       D.  $4x^2 + 8x + 4$

41. Let  $f(x) = \frac{1}{x}$  and  $g(x) = \frac{1}{(x+3)}$ .

Describe the transformation from  $f(x)$  to  $g(x)$ .

- A. translated 3 units to the right
- B. translated 3 units up
- C. translated 3 units to the left
- D. translated 3 units down

42. Let  $f(x) = \frac{1}{x}$  and  $g(x) = \frac{1}{x} - 4$ .

Describe the transformation from  $f(x)$  to  $g(x)$ .

- A. translated 4 units to the right
- B. translated 4 units up
- C. translated 4 units to the left
- D. translated 4 units down

43. Solve:  $\log_2(x-3) + \log_2(x+1) = 5$

- A. -7, -5
- B. -7, 5
- C. -5, 7
- D. 7

44. Solve:  $2^{4x-1} = 32$

- A.  $\frac{3}{2}$
- B. 1
- C.  $\frac{17}{4}$
- D.  $\frac{1}{2}$

45. Solve for  $x$ :  $\log_5 x = 3$

- A.  $-\frac{5}{3}$
- B. 125
- C. 81
- D. 15

46. Convert to radians:  $315^\circ$

- A.  $\frac{7\pi}{4}$
- B.  $\frac{5\pi}{4}$
- C.  $\frac{11\pi}{6}$
- D.  $\frac{5\pi}{3}$

47. Express  $\frac{8\pi}{3}$  radians in degrees.

- A.  $8^\circ$
- B.  $68^\circ$
- C.  $145^\circ$
- D.  $480^\circ$

48. In which quadrant does the terminal ray of a standard position angle of  $\frac{7}{3}\pi$  radians lie?

- A. I
- B. III
- C. IV
- D. there is no terminal ray

49. Which of the following angles is coterminal with  $-610^\circ$ ?

- A.  $20^\circ$
- B.  $110^\circ$
- C.  $250^\circ$
- D.  $610^\circ$

50. Determine the exact value of  $\sin\left(-\frac{\pi}{6}\right)$ .

- A.  $\frac{\sqrt{3}}{2}$
- B.  $-\frac{\sqrt{3}}{2}$
- C.  $-\frac{1}{2}$
- D.  $\sqrt{3}$

51. Determine the exact value of  $\sin\frac{\pi}{4}$ .

- A.  $\frac{1}{2}$
- B.  $\frac{\sqrt{2}}{2}$
- C.  $\frac{\sqrt{3}}{2}$
- D. 1

52. Determine the exact value of  $\cos \frac{\pi}{3}$ .

- A.  $\frac{1}{2}$     B.  $\frac{\sqrt{2}}{2}$     C.  $\frac{\sqrt{3}}{2}$     D.  $\sqrt{3}$

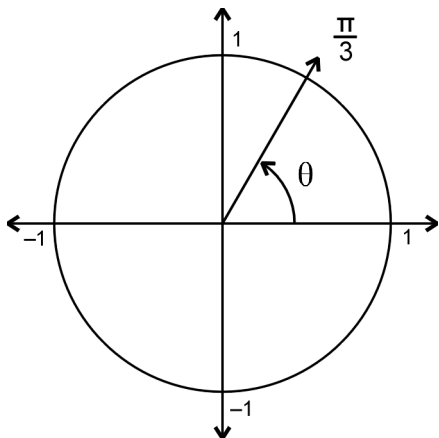
53. Find the exact value of  $\tan \frac{\pi}{6}$ .

- A.  $\sqrt{3}$     B. 1    C.  $\frac{\sqrt{3}}{2}$     D.  $\frac{\sqrt{3}}{3}$

54. Find the exact value of  $\tan \frac{\pi}{3}$ .

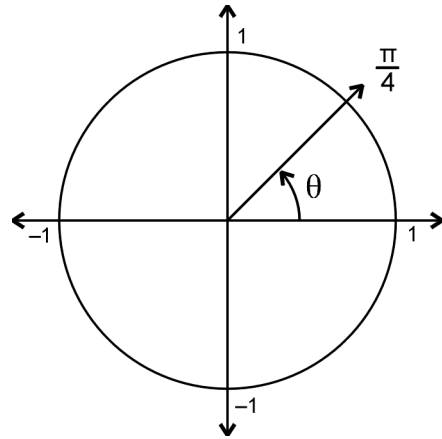
- A.  $\sqrt{3}$     B. 1    C.  $\frac{\sqrt{3}}{2}$     D.  $\frac{\sqrt{3}}{3}$

55. In the diagram of the unit circle, what is  $\sin \theta$ ?



- A.  $\frac{\sqrt{2}}{2}$     B.  $\frac{\sqrt{3}}{2}$     C.  $\frac{1}{2}$     D.  $\frac{\sqrt{3}}{3}$

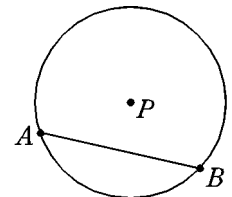
56. In the diagram of the unit circle, what is  $\cos \theta$ ?



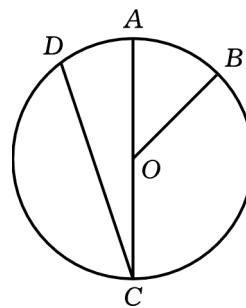
- A.  $\frac{\sqrt{2}}{2}$     B.  $\frac{1}{2}$     C.  $\frac{\sqrt{3}}{3}$     D.  $\frac{\sqrt{3}}{2}$

57. In circle  $P$ ,  $\overline{AB}$  is a \_\_\_\_\_.

- A. diameter  
B. radius  
C. circumference  
D. chord

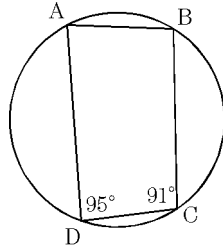


58. If  $m\angle AOB = 50^\circ$ , then  $m\angle BOC = ?$

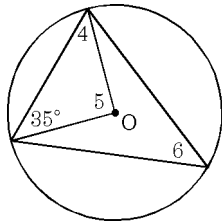


59. What is the measure, in degrees, of  $\angle B$ ?

- A. 85
- B. 89
- C. 95
- D. 99



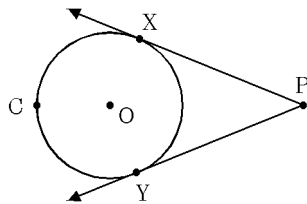
60. Given circle  $O$ , find the measure of each of the following.



- a)  $m\angle 4$
- b)  $m\angle 5$
- c)  $m\angle 6$

61. In the figure,  $\overrightarrow{PX}$  and  $\overrightarrow{PY}$  are drawn to the circle. If  $m\widehat{XY} = 120^\circ$ , then what is the measure of angle  $P$ ?

- A.  $40^\circ$
- B.  $60^\circ$
- C.  $100^\circ$
- D.  $120^\circ$



62. What is the equation of the circle centered at  $(4, -5)$  with a radius of 16?

- A.  $(x + 4)^2 + (y - 5)^2 = 16$
- B.  $(x - 4)^2 + (y + 5)^2 = 4$
- C.  $(x - 4)^2 + (y + 5)^2 = 256$
- D.  $(x + 4)^2 + (y - 5)^2 = 4$

63. Find the center and radius of the circle  $x^2 + y^2 + 4x - 6y + 12 = 0$ .

- A.  $(-2, 3); 2\sqrt{3}$
- B.  $(2, -3); 2\sqrt{3}$
- C.  $(1, -2); 1$
- D.  $(-2, 3); 1$

64. Identify the vertex, focus and directrix of the graph of  $y = 3(x - 5)^2 + 1$ .



1.  
Answer: A  
Objective: N.CN.2
2.  
Answer: A  
Objective: N.CN.2
3.  
Answer: B  
Objective: N.CN.2
4.  
Answer: C  
Objective: N.CN.7
5.  
Answer: C  
Objective: N.CN.7
6.  
Answer: C  
Objective: N.CN.7
7.  
Answer: D  
Objective: A.REI.4B
8.  
Answer: B  
Objective: N.CN.9
9.  
Answer: C  
Objective: A.SSE.2
10.  
Answer: C  
Objective: A.SSE.2
11.  
Answer: D  
Objective: A.SSE.2
12.  
Answer: B  
Objective: A.SSE.3A
13.  
Answer: D  
Objective: A.SSE.3A
14.  
Answer: C  
Objective: A.SSE.3A

15.  
Answer: B  
Objective: A.SSE.3A
16.  
Answer: D  
Objective: A.SSE.3A
17.  
Answer: D  
Objective: A.SSE.3B
18.  
Answer: D  
Objective: A.APR.1
19.  
Answer: C  
Objective: A.APR.1
20.  
Answer: A  
Objective: A.APR.1
21.  
Answer: B  
Objective: A.APR.2
22.  
Answer: A  
Objective: A.APR.6
23.  
Answer: C  
Objective: A.APR.2
24.  
Answer: A  
Objective: A.APR.2
25.  
Answer: -14  
Objective: A.APR.2
26.  
Answer: A  
Objective: A.APR.3
27.  
Answer: A  
Objective: A.APR.3

28.	Answer: D Objective: A.APR.3	43.	Answer: D Objective: F.BF.5
29.	Answer: A Objective: A.APR.6	44.	Answer: A Objective: F.BF.5
30.	Answer: D Objective: A.APR.6	45.	Answer: B Objective: F.BF.5
31.	Answer: C Objective: A.APR.7	46.	Answer: A Objective: F.TF.1
32.	Answer: A Objective: A.APR.7	47.	Answer: D Objective: F.TF.1
33.	Answer: B Objective: A.APR.7	48.	Answer: A Objective: F.TF.2
34.	Answer: B Objective: A.CED.3	49.	Answer: B Objective: F.TF.2
35.	Answer: D Objective: A.REI.2	50.	Answer: C Objective: F.TF.3
36.	Answer: C Objective: A.REI.4A	51.	Answer: B Objective: F.TF.3
37.	Answer: $y = 2(x - 6)^2 - 3$ ; $y = -(x - 3)^2 + 1$ ; $y = 3(x - \frac{1}{2})^2 + 5$ Objective: A.REI.4A	52.	Answer: A Objective: F.TF.3
38.	Answer: 0; (1, -1); inc: $\emptyset$ , dec: $x \neq 1$ ; [graph] Objective: F.IF.7C	53.	Answer: D Objective: F.TF.3
39.	Answer: -6, 4; -6, 4; same, because the solutions are $x$ -intercepts Objective: F.IF.8A	54.	Answer: A Objective: F.TF.3
40.	Answer: B Objective: F.BF.1C	55.	Answer: B Objective: F.TF.3
41.	Answer: C Objective: F.BF.3	56.	Answer: A Objective: F.TF.3
42.	Answer: D Objective: F.BF.3	57.	Answer: D Objective: G.C.2

58.  
Answer:  $130^\circ$   
Objective: G.C.2
59.  
Answer: A  
Objective: G.C.3
60.  
Answer:  $35^\circ$ ;  $110^\circ$ ;  $55^\circ$   
Objective: G.C.3
61.  
Answer: B  
Objective: G.C.4
62.  
Answer: C  
Objective: G.GPE.1
63.  
Answer: D  
Objective: G.GPE.1
64.  
Answer: