

Math 3 Final Exam Review

1. Solve  $5 + \sqrt{2x - 4} = 11$
2. What are the solutions of  $2t^2 + 11t = 6$
3. What is the vertex of the parabola whose equation is  $y = 3x^2 + 6x + 5$
4. What is the radius of the circle with equation  $x^2 + 4x + y^2 - 8y = 9$
5. Given  $g(x) = (x + 3)^2 - 2$ , find  $g(5)$ .

$$3x + y - z = 8$$

6. Find the value of  $z$  in the following system:  
 $x - y + 2z = -7$   
 $-x + 3y + z = 2$

7. What is the value of the discriminant for the equation  $3b^2 - 2b = 6$
8. What is the solution set of  $(g - 4)(2g + 1) < 0$

9. Find the inverse of  $f(x) = \frac{1}{2}x - 3$

10. Find  $\frac{2y^2 + 3y - 2}{y + 3} \div \frac{2y^2 - 3y + 1}{y^2 + 5y + 6}$

11. Solve  $\frac{2d - 1}{d - 4} + 2 = \frac{-5d}{d - 4}$

12. Find  $y$  when  $x = 14$  if  $y$  varies inversely as  $x$  and  $y = 5$  when  $x = 8$ .

13. Evaluate  $\log_4 \frac{1}{64}$

14. Solve  $\log_{125} x = \frac{2}{3}$

15. Solve  $2 \log_5 x - \log_5 2 = \log_5 18$

16. What is the 12<sup>th</sup> term of the arithmetic sequence with  $a_1 = 5$  and  $d = 6$ ?
17. Evaluate  $\sum_{t=3}^7 (2t-1)$
18. Divide  $(x^4 + 3x^2 + 6x - 3) \div (x-1)$
19. If  $f(x) = x+1$  and  $g(x) = 2x^2 - 3$  find  $f(g(x))$
20. If  $y$  varies jointly as  $x$  and  $z$  and  $y = 36$  when  $x = 2$  and  $z = -4$ , find  $y$  when  $x = -6$  and  $z = 3$ .
21. Solve  $\log_2(x+3) + \log_2(x-3) = 4$
22. Find the sum of the series  $8 + 4 + 2 + \dots$
23. Find all rational zeros of  $f(x) = x^3 - 2x^2 - 5x + 6$
24. Simplify  $(4-3i)(4+3i)$
25. Factor  $x^3 - 3x^2 + 5x - 15$
26. Factor  $3x^2 + 13x - 10$
27. Divide using long division  $(6x^3 - x^2 + 14x + 2) \div (3x+1)$
28. Describe the roots  $3x^2 = 8x - 4$
29. Solve by completing the square  $x^2 - 5x = 6$
30. Write the equation of the graph of  $y = \frac{1}{x}$  that is translated 2 units left and 1 unit down
31. Find all horizontal and vertical asymptotes of  $f(x) = \frac{x+2}{x^2+4x-5}$
32. Simplify  $5i(3+2i) - 4(2-3i)$
33. Divide  $(x^4 + x^2 - 6) \div (x^2 + 3)$
34. Find all roots of  $x^3 + 2x^2 - 13x + 10 = 0$
35. Find a polynomial of degree 3 with the following zeros: 5, 2i.
36. Solve  $4 + 5^x = 29$

37. Solve  $e^{\frac{x}{4}} = 5$

38. Simplify  $(4 + 3i)^2$

39. Factor  $x^3 - 64$

40. Find the inverse of  $f(x) = \log_8(x - 2)$

41. Solve  $\ln(x - 3) = 5$

42. Solve  $2 - 4^x = -62$

43. Solve  $\frac{-4}{x+1} = \frac{2}{x-1}$

44. Simplify  $\frac{\frac{9}{x+1}}{\frac{1}{3} - \frac{6}{x+1}}$

45. Find the sum of  $\sum_{k=1}^7 3k^2$

46. Multiply  $\frac{x^2 - x - 20}{x + 4} \cdot \frac{x - 3}{x^2 - 2x - 15}$

47. Divide  $\frac{x^2 - 1}{2x^2 - x - 1} \div \frac{x^2 - 4}{2x^2 - 3x - 2}$

48. Given that  $f(x) = x^2$  and  $g(x) = 4x - 3$  find  $f(g(2))$

49. Find the values of  $x$  and  $y$ , if  $(x + yi) - (5 - 3i) = 7 - 9i$

$$\begin{aligned} \textcircled{1} \quad \sqrt{2x-4} &= 6 \\ 2x-4 &= 36 \\ 2x &= 40 \\ x &= 20 \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad 2x^2 + 11x - 6 &= 0 \\ 2x^2 + 12x - 1x - 6 &= 0 \\ 2x(x+6) - 1(x+6) &= 0 \\ (x+6)(2x-1) &= 0 \\ x = \frac{1}{2} \quad x &= -6 \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad y &= 3x^2 + 6x + 5 \\ x &= \frac{-b}{2a} \\ x &= \frac{-6}{2(3)} = -1 \\ y &= 3(-1)^2 + 6(-1) + 5 = 2 \end{aligned}$$

$$\begin{aligned} \textcircled{4} \quad x^2 + 4x + 4 + y^2 - 8y + 16 &= 9 \\ (x+2)^2 + (y-4)^2 &= 29 \end{aligned}$$

$$r = \sqrt{29}$$

$$\text{Ctr} = (-2, 4)$$

$$(-1, 2)$$

$$\begin{aligned} \textcircled{5} \quad g(x) &= (x+3)^2 - 2 \\ &= (5+3)^2 - 2 \\ &= 62 \end{aligned}$$

⑥

$$\begin{aligned} \textcircled{1} \quad 3b^2 - 2b - 6 &= 0 \\ b^2 - 4ac &= (-2)^2 - 4(3)(-6) \\ &= 4 + 72 \end{aligned}$$

$$76$$

2 Real I/r

⑧

$$\begin{aligned} \textcircled{9} \quad y &= \frac{1}{2}x - 3 \\ x &= \frac{1}{2}y - 3 \\ x+3 &= \frac{1}{2}y \\ 2x+6 &= y^{-1} \end{aligned}$$

$$b^2 - 4ac < 0 \quad 2 \text{ Imag}$$

$$= 0 \quad 1 \text{ Real}$$

$$120+$$

$$> 0$$

+ Perf Sq

2 real I/r

$$\textcircled{10} \frac{(2y-1)(y+2)}{y+3} \cdot \frac{(y+3)(y+2)}{(2y-1)(y-1)}$$

$$\boxed{\frac{(y+2)^2}{y-1}}$$

$$\textcircled{11} \begin{aligned} 2d-1+2(d-4) &= -5d \\ 2d-1+2d-8 &= -5d \\ 4d-9 &= -5d \\ \boxed{d=1} \end{aligned}$$

$$\textcircled{12} \begin{aligned} y &= \frac{k}{x} \\ 5 &= \frac{k}{8} \\ 40 &= k \end{aligned} \left| \begin{aligned} y &= \frac{k}{x} \\ y &= \frac{40}{14} \\ \boxed{y &= \frac{20}{7}} \end{aligned} \right.$$

$$\textcircled{13} 4^x = \frac{1}{64}$$

$$\boxed{x = -3}$$

$$\textcircled{14} 125^{2/3} = x$$

$$\boxed{25 = x}$$

$$\textcircled{15} \log_5 \frac{x^2}{2} = \log_5 18$$

$$x^2 = 36$$

$$x = \pm 6$$

$$\boxed{x = 6}$$

$$\textcircled{18} \begin{array}{r} 1 \overline{) 1 \ 0 \ 3 \ 6 \ -3} \\ \underline{1 \ 1 \ 4 \ 10} \\ 1 \ 1 \ 4 \ 10 \ \textcircled{7} \end{array}$$

$$\boxed{1x^3 + 1x^2 + 4x + 10 + \frac{7}{x-1}}$$

$$\textcircled{19} \begin{aligned} f(x) &= x+1 \\ g(x) &= 2x^2-3 \\ f(g(x)) & \\ f(2x^2-3) & \\ 2x^2-3+1 & \\ \boxed{2x^2-2} & \end{aligned}$$

$$\begin{array}{l} \textcircled{20} \quad y = kxz \\ 36 = k(2)(-4) \\ 36 = \frac{-8k}{-8} \\ -\frac{9}{2} = k \end{array} \left| \begin{array}{l} y = kxz \\ y = -\frac{9}{2}xz \\ y = -\frac{9}{2}(-6)(3) \\ y = -\frac{9}{2}(-18) \end{array} \right.$$

$$\boxed{y = 81}$$

$$\begin{array}{l} \textcircled{21} \quad \log_2(x^2 - 9) = 4 \\ 16 = x^2 - 9 \\ 25 = x^2 \\ \pm 5 = x \\ \boxed{x = 5} \end{array}$$

$$\textcircled{23} \quad f(x) = x^3 - 2x^2 - 5x + 6$$

$$\pm 1 \pm 2 \pm 3 \pm 6$$

$$\{-2, 3, 13\}$$

$$-8 - 8 + 10 + 6$$

$$\begin{array}{r|rrrr} -2 & 1 & -2 & -5 & 6 \\ & & -2 & 8 & -6 \\ \hline & 1 & -4 & 3 & 0 \end{array}$$

$$\begin{array}{l} x^2 - 4x + 3 = 0 \\ (x-3)(x-1) = 0 \end{array}$$

$$24. \quad 16 - 9i^2$$

$$\boxed{25}$$

$$\begin{array}{l} 25 \quad x^3 - 3x^2 + 5x - 15 \\ x^2(x-3) + 5(x-3) \\ \boxed{(x^2 + 5)(x-3)} \end{array}$$

$$\begin{array}{l} 26 \quad 3x^2 + 13x - 10 \\ 3x^2 + 15x - 2x - 10 \\ 3x(x+5) - 2(x+5) \end{array}$$

$$\begin{array}{r} -30 \\ 15 \times -2 \\ 13 \end{array}$$

$$\boxed{(3x-2)(x+5)}$$

(27)  $3x+1 \sqrt{\frac{2x^2 - x + 5}{6x^3 - x^2 + 14x + 2}} + \frac{-3}{3x+1}$

$$\begin{array}{r} \ominus 6x^3 \oplus 2x^2 \\ \hline -3x^2 + 14x \\ + 3x^2 + x \\ \hline 15x + 2 \\ \ominus 15x \oplus 5 \\ \hline -3 \end{array}$$

(28)  $3x^2 - 8x + 4 = 0$

$$(-8)^2 - 4(3)(4)$$

$$64 - 48$$

16

2 Real Rot

29.  $x^2 - 5x + \frac{25}{4} = 6 + \frac{25}{4}$

$$\left(x - \frac{5}{2}\right)^2 = \frac{49}{4}$$

$$x - \frac{5}{2} = \pm \frac{7}{2}$$

$$\frac{5}{2} \pm \frac{7}{2}$$

$$\{6, -1\}$$

(30)  $y = \frac{1}{x+2} - 1$

31) HA  $y=0$

VA  $(x+5)(x-1)$

$x=-5$   $x=1$

32)  $15i + 10i^2 - 8 + 12i$

$27i - 18$

33. 
$$\begin{array}{r} x^2 - 2 \\ \hline x^2 + 3 \overline{) x^4 + 0x^3 + x^2 + 0x - 6} \\ \underline{x^4 \phantom{+ 0x^3} + 3x^2} \phantom{- 6} \\ -2x^2 + -6 \\ \underline{-2x^2 - 6} \\ 0 \end{array}$$

34. 
$$\begin{array}{r|rrrr} 1 & 1 & 2 & -13 & 10 \\ & & 1 & 3 & -10 \\ \hline & 1 & 3 & -10 & 0 \end{array}$$

$x^2 + 3x - 10$   
 $(x+5)(x-2) = 0$

$x = -5$   $x = 2$

$\{-5, 2, 13\}$

35  $x=5$   $x=2i$   $x=-2i$   
 $x-5=0$   $x-2i=0$   $x+2i=0$

$(x-5)(x^2+4)$   
 $x^3+4x-5x^2-20$

$x^2 - 2xi + 2xi - 4i^2 = 0$

$x^2 + 4 = 0$

$0 = x^3 - 5x^2 + 4x - 20$



$$(36) 5^x = 25$$

$$\boxed{x = 2}$$

$$(37) \ln e^{x/4} = 5$$

$$\frac{x}{4} \ln e = \ln 5$$

$$\frac{x}{4} = \ln 5$$

$$\boxed{x = 6.44}$$

$$38. 16 + 24i + 9i^2$$

$$\boxed{7 + 24i}$$

$$(39) (x-4)(x^2 + 4x + 16)$$

$$(40) y = \log_8 (x-2)$$

$$\downarrow$$
$$x = \log_8 (y-2)$$

$$8^x = y-2$$

$$\boxed{8^x + 2 = y^{-1}}$$

$$(41) \ln(x-3) = 5$$

$$e^5 = x-3$$

$$\boxed{x = 151.4}$$

$$(42) -4^x = -64$$

$$4^x = 64$$

$$\boxed{x = 3}$$

$$\textcircled{43} -4(x-1) = 2(x+1)$$

$$-4x+4 = 2x+2$$

$$2 = 6x$$
$$\boxed{\frac{1}{3} = x}$$

$$\textcircled{44}$$

$$\frac{9}{x+1} \div \left( \frac{1}{3} - \frac{k}{x+1} \right)$$

$$\left( \frac{9}{x+1} \right) \div \frac{x-1-18}{3(x+1)}$$

$$\frac{9}{x+1} \div \frac{x-19}{3(x+1)}$$

$$\frac{9}{x+1} \cdot \frac{3(x+1)}{x-19}$$

$$\boxed{\frac{27}{x-19}}$$

$$\textcircled{46} \frac{(x-5)(x+4)}{x+4} \cdot \frac{x-3}{(x-5)(x+2)}$$

$$\boxed{\frac{x-3}{x+2}}$$

$$\textcircled{47} \frac{(x+1)(x+1)}{(2x+1)(x+1)} \cdot \frac{(2x+1)(x-2)}{x-2 \quad x+2}$$

$$\boxed{\frac{x+1}{x+2}}$$

$$\textcircled{48} f(g(2))$$
$$f(5)$$
$$\boxed{25}$$

$$\textcircled{49}$$

$$x + yi - 5 + 3i = 7 - 9i$$

$$x - 5 = 7$$

$$\textcircled{x=12}$$

$$y + 3 = -9$$

$$\textcircled{y=-12}$$

