Name _____

Algebra II Vertex form and completing the square

Solve using the complete the square method:

1. $x^2 - 8x + 10 = 0$

$x^2 - 8x = -10$

$+16 \quad +16$

$(x-4)^2 = 6$

$x - 4 = \pm\sqrt{6}$

$x = 4 \pm \sqrt{6}$

2. $x^2 + 6x = 6$

$x^2 + 6x = 6$

$+9 \quad +9$

$(x+3)^2 = 15$

$x = -3 \pm \sqrt{15}$

3. $x^2 - 12x + 11 = 0$

$x^2 - 12x = -11$

$+36 \quad +36$

$(x-6)^2 = 25$

$x - 6 = 5$ and -5

3. $x = 11$ and 1

4. $8x^2 + 16x = 42$

$x^2 + 2x = \frac{21}{4}$

$+1 \quad +1$

$(x+1)^2 = \frac{25}{4}$

$x + 1 = \frac{5}{2}$ and $-\frac{5}{2}$

4. $x = \frac{3}{2}$ and $-\frac{7}{2}$

5. $4x^2 + 8x - 16 = 20$

$4x^2 + 8x = 36$

$x^2 + 2x = 9$

$+1 \quad +1$

$(x+1)^2 = 10$

5. $x = -1 \pm \sqrt{10}$

6. $2x^2 - x = 14$

$x^2 - \frac{1}{2}x = 7$

$+\frac{1}{16} \quad +\frac{1}{16}$

$\left(x - \frac{1}{4}\right)^2 = \frac{113}{16}$

$x - \frac{1}{4} =$

6. $\frac{1 \pm \sqrt{113}}{4}$

7. $3x^2 + 5x = x + 3$

$3x^2 + 4x = 3$

$x^2 + \frac{4}{3}x = 1$

$+\frac{4}{9} \quad +\frac{4}{9}$

$\left(x + \frac{2}{3}\right)^2 = \frac{13}{9}$

7. $x = \frac{-2 \pm \sqrt{13}}{3}$

8. $-x^2 - 2x = 3$

$x^2 + 2x = -3$

$+1 \quad +1$

$(x+1)^2 = -2$

$x + 1 = \pm i\sqrt{2}$

8. $x = -1 \pm i\sqrt{2}$

9. $2x^2 + 10x = x^2 - 8x$

$x^2 + 18x = 0$

$+81 \quad +81$

$(x+9)^2 = 81$

$x + 9 = \pm 9$

$x = 0$ and -18

10. $2x^2 + 12 = -x + 10$

$2x^2 + x = -2$

$x^2 + \frac{1}{2}x + \frac{1}{16} = -1 + \frac{1}{16}$

$\sqrt{\left(x + \frac{1}{4}\right)^2} = \sqrt{-\frac{15}{16}}$

$x + \frac{1}{4} = \pm\frac{i\sqrt{15}}{4}$

10. $x = \frac{-1 \pm i\sqrt{15}}{4}$

Use the complete the square method to rewrite the function in vertex form (11-20)

11. $y = x^2 - 14x + 6$

$y = x^2 - 14x + 49 + 6 - 49$

$y = (x-7)^2 - 43$

12. $y = x^2 - 3x + 3$

$y = x^2 - 3x + \frac{9}{4} + 3 - \frac{9}{4}$

$y = \left(x - \frac{3}{2}\right)^2 + \frac{3}{4}$

13. $y = -x^2 + 5x - 2$

$y = -1\left(x^2 - 5x + \frac{25}{4}\right) - 2 - \left[\frac{25}{4}(-1)\right]$

$y = -1\left(x - \frac{5}{2}\right)^2 - 2 + \frac{25}{4}$

$y = -\left(x - \frac{5}{2}\right)^2 + \frac{17}{4}$

14. $y = 3x^2 + 9x + 5$

$y = 3\left(x^2 + 3x + \frac{9}{4}\right) + 5 - \left[\frac{9}{4}(3)\right]$

$y = 3\left(x + \frac{3}{2}\right)^2 + 5 - \frac{27}{4}$

$y = 3\left(x + \frac{3}{2}\right)^2 - \frac{7}{4}$

15. $y = -2x^2 - 8x + 2$ $-2(x^2+4x+\underline{4}) + 2 - [\underline{4}(-2)]$

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

$y = -2(x+2)^2 + 10$

16. $y = 3x^2 + 12x - 2$ $3(x^2+4x+\underline{4}) - 2 - [\underline{4}(3)]$

$y = 3(x+2)^2 - 14$

17. $y = -4x^2 + 2x + 9$ $-4(x^2 - \frac{1}{2}x + \underline{\frac{1}{16}}) + 9 - [\frac{1}{16}(-4)]$

$-4(x-\frac{1}{4})^2 + 9 + \frac{1}{4}$

$-4(x-\frac{1}{4})^2 + \frac{37}{4}$

18. $y = \frac{1}{2}x^2 + 4x + 2$ $\frac{1}{2}(x^2+8x+\underline{16}) + 2 - [\underline{16}(\frac{1}{2})]$

$\frac{1}{2}(x+4)^2 + 2 - 8$

$\frac{1}{2}(x+4)^2 - 6$

19. $y = 2x^2 + 10x - 1$ $2(x^2+5x+\underline{25/4}) - 1 - [\underline{25/4}(2)]$

$2(x+\frac{5}{2})^2 - 1 - \frac{25}{2}$

$2(x+\frac{5}{2})^2 - \frac{27}{2}$

20. $y = 2x^2 - 4x + 3$ $2(x^2-2x+\underline{1}) + 3 - [\underline{1}(2)]$

$2(x-1)^2 + 3 - 2$

$2(x-1)^2 + 1$

Mixed review

21. Write as a single log: $\log_7 x + \log_7 y - 2\log_7 z$ $\log_7 \frac{xy}{z^2}$

For #22-23: evaluate:

22. $2\log_3 3 - \log_3 3$ $\frac{\log_3 3^2}{\log_3 3} = \log_3 3$

$3^x = 3$

$x = 1$

23. $\log_6 4 + \log_6 9$ $\log_6 4 \cdot 9$

$\log_6 36$

$6^x = 36$

$x = 2$

For #24-29: Solve

24. $14^{x+1} = 36$

$\log_{14} 14^{x+1} = \log_{14} 36$

$x+1 = \frac{\log 36}{\log 14}$

$x = 0.358$

25. $5^x = 81.2$

$\log_5 5^x = \log_5 81.2$

$x = \frac{\log 81.2}{\log 5}$

$x = 2.732$

26. $\log(3x+1) = 2$

$10^{\log(3x+1)} = 10^2$

$3x+1 = 100$

$3x = 99$

$x = 33$

27. $\text{Log}6x - 3 = -4$

$10^{\log 6x} = 10^{-1}$

$6x = .1$

$x = .0167$

28. $\frac{2\log(x+1)}{2} = \frac{5}{2}$

$10^{\log(x+1)} = 10^{\frac{5}{2}}$

$x+1 = 316.2$

$x = 315.2$

29. $2\log x + \log 4 = 2$

$10^{\log 4x^2} = 10^2$

$4x^2 = 100$

$x^2 = 25$

$x = 5$