Work out the solutions to each problem on loose leaf paper. Show all work and steps to demonstrate concept mastery.

Rational Expressions

Example: Simplify: $\frac{x^2-4x-12}{x^2-4} = \frac{(x+2)(x-6)}{(x+2)(x-2)} = \frac{\cancel{(x+2)}(x-6)}{\cancel{(x+2)}(x-2)} = \frac{x-6}{x-2}$

1. $\frac{3x^3}{12x^2+9x} =$

2. $\frac{x^2-x-6}{x^2-9} =$

3. $\frac{x^2-3x+2}{x^2+5x-6} =$

4. $\frac{x^2-2x-3}{x^2-7x+12} =$

5. $\frac{3x^2-3x-6}{x^2-4} =$

6. $\frac{x^2+6x+9}{x^2-9} =$

7. $\frac{3x^2+x-2}{x^2+3x+2} =$

8. $\frac{2x^2+7x+3}{x^2+5x+6} =$

Quadratic Equations

Example: Solve by factoring: $8x^2 - 6x - 5 = 0$ Standard Form $(equation = 0)$

$(4x - 5)(2x + 1) = 0$ Factor

$x = \frac{5}{4}, -\frac{1}{2}$ Set factors equal to zero & solve.

Solve each quadratic equation by factoring.

9. $x^2 - 3x - 4 = 0$

10. $5x^2 - 13x + 6 = 0$

11. $40x^2 + 4x = 0$

12. $x^2 + 9x = -20$

13. $16x^2 = 8x - 1$

14. $81x^2 - 16 = 0$

Example: Solve by using the quadratic formula. $2x^2 + x - 5 = 0$

$a = 2,\ b = 1,\ c = -5$

$b^2 - 4ac = (1)^2 - 4(2)(-5) = 41$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-1 \pm \sqrt{41}}{4}$

Solve by using the quadratic formula.

15. $4x^2 + 9x + 3 = 0$

16. $8x^2 + 4x + 5 = 0$

17. $3x^2 + 6x = -2$

18. $x^2 = 8x - 35$

Linear Equations

Example: Write the equation of the line passing through the point $(3, -5)$ with slope 4.

$y - y_1 = m(x - x_1)$: Substitute $x_1 = 3,\ y_1 = -5,\ m = 4$

$y - (-5) = 4(x - 3)$

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

Write the equation of the line using the information given.

19. passes through $(-6,1)$ with slope -3

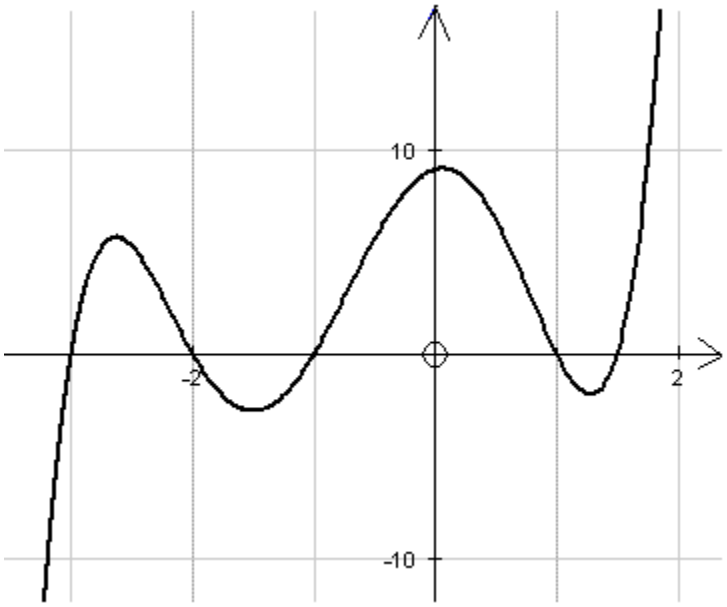
20. passes through $(-4, -2)$ with slope $\frac{1}{2}$

21. passes through $(3,8)$ and is parallel to $y - 5x = 1$

22. passes through $(-1,7)$ and is perpendicular to $y = -3x + 4$

Rapid Sketching

Example: Sketch $y = (x+3)(x+2)(x+1)(x-1)(x-1.5)$



Sketch each of the following.

23. $y = (x+2)(x-1)(x-3)$

24. $y = x^2(x-2)$

25. $y = (x+1)^2(x-1)(x-3)^2$

26. $y = -(x+2)^2(x-2)(x-5)^2$

Trigonometry

Simplify each of the following. These should be done from memory. Refresh your understanding of the unit circle.

27. $\sin\frac{5}{6}\pi =$

28. $\cos\frac{4}{3}\pi =$

29. $\tan\frac{3}{4}\pi =$

30. $\csc\frac{11}{6}\pi =$

31. $\sec\frac{5}{4}\pi =$

32. $\cot\frac{2}{3}\pi =$

33. $\sin^{-1}\left(\frac{\sqrt{2}}{2}\right) =$

34. $\tan^{-1}(1) =$

35. $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right) =$

Simplify each of the following.

36. $\cot x \cdot \sec x =$

37. $\sec^2 x - \tan^2 x =$

38. $1 - \cos^2 x =$

39. $1 - \sin^2 x =$

40. $\sin x + \cos x \cot x =$

41. $\frac{\cos^2 x + \sin^2 x}{1 + \tan^2 x} =$

Logarithms

Condense each of the following using the Laws of Logarithms.

42. $\ln(5) + \ln(3) =$

43. $\ln(24) - \ln(6) =$

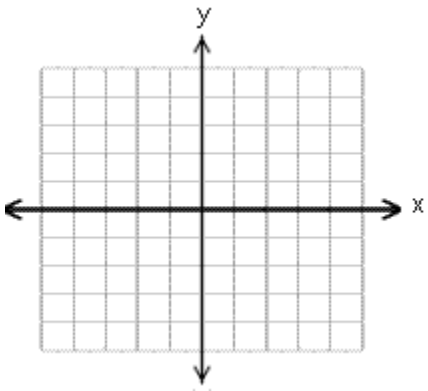
44. $2\ln(5) - \ln(2) =$

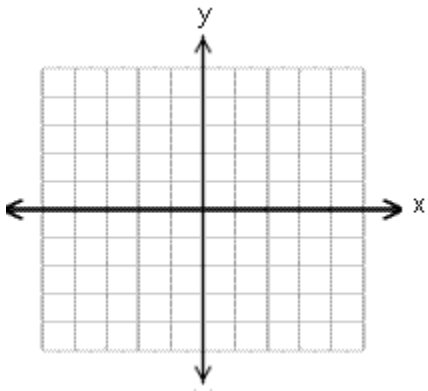
Sketch each of the following.

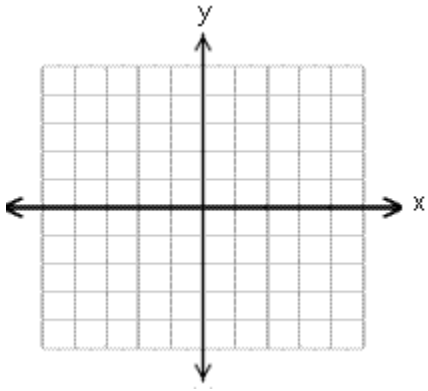
45. $y = e^x$

46. $y = e^{-x}$

47. $y = \ln(x)$



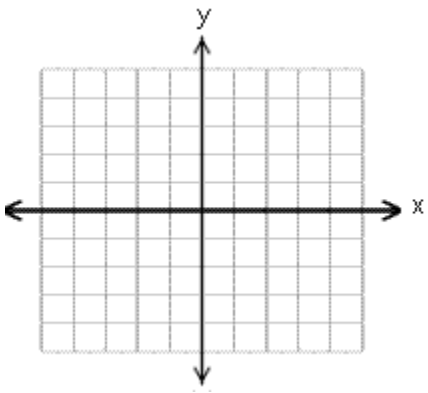




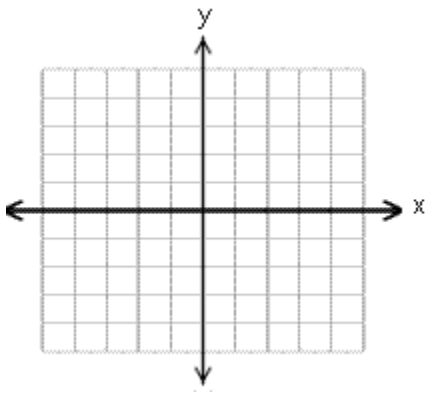
Parent Graphs

Sketch each of the following. These should be done by memory.

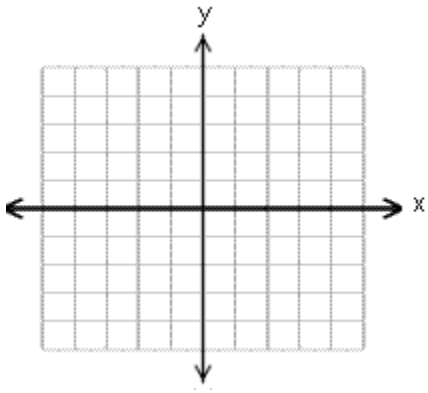
48. $y = \frac{1}{x}$



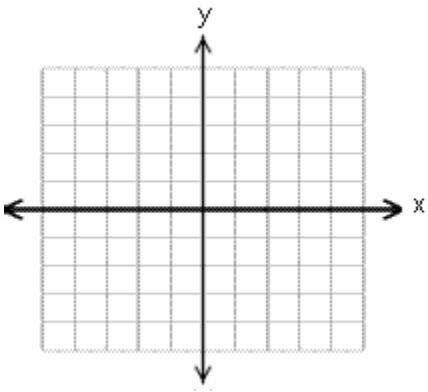
49. $y = |x|$



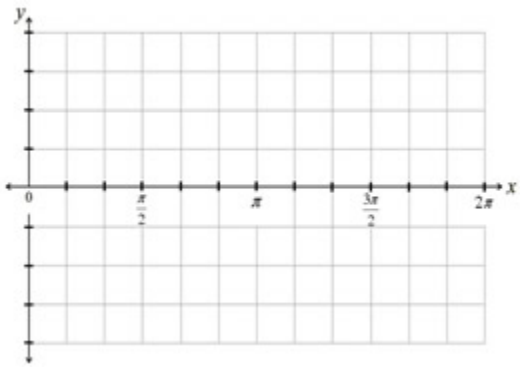
50. $y = \sqrt{x}$



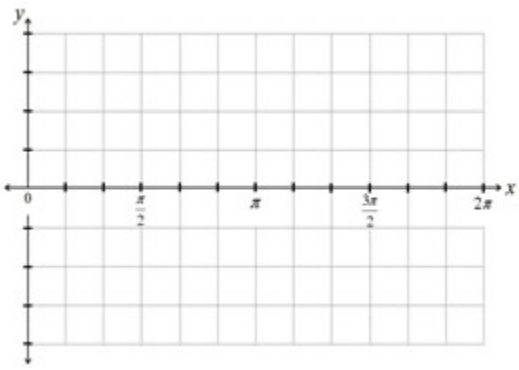
51. $y = \sqrt[3]{x}$



52. $y = \sin(x)$



53. $y = \cos(x)$



54. $y = \tan^{-1}(x)$