

# Lawrence High School

## Math Department



# Summer Review

## For Students Entering

### Precalculus

Please show your work on the following problems. This packet will be collected by your math teacher so don't forget to bring your finished work back with you in August. If you need assistance on a topic check out: <https://www.wolframalpha.com/>, <https://www.khanacademy.org/>, <http://www.purplemath.com/>, or google the topic.

## Sequences and Series

Find the first five terms of the given sequences below. Also identify it as recursive or explicit.

1.  $u_n = 3n - 5$

2.  $u_n = -2u_{n-1} + 3$   
 $u_1 = -5$

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3.  $u_n = 4n - n^2 + 1$

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4.  $u_n = u_{n-1} + 2n - 3$   
 $u_1 = 4$

---

5.  $u_n = 5u_{n-2} - 3u_{n-1}$   
 $u_1 = 7 \quad u_2 = 3$

---

6.  $u_n = \frac{1}{6}n^3 + \frac{1}{2}n^2 + \frac{1}{6}n$

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Find the sum of the following series, if it has one.

7.  $\sum_{n=0}^{20} (3n - 5)$

8.  $\sum_{n=1}^{10} 2\left(\frac{3}{2}\right)^n$

9.  $\sum_{n=0}^{\infty} \left(-\frac{1}{2}\right)^n$

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10. Is it better to be paid \$5 per day for 100 days or to be paid 5¢ the first day, 10¢ the second day, 20¢ the third day, and so on for 100 days? By how much?

## *Quadratics*

**Solve each equation by factoring.**

11.  $x^2 + 5x + 6 = 0$

12.  $x^2 + x = 20$

13.  $3x^2 - x - 2 = 0$

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14.  $18x^2 = 23x + 6$

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15.  $8x^2 - 50 = 0$

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16.  $3x^3 - 12x^2 + 2x - 8 = 0$

---

**Solve the equation by completing the square.**

17.  $x^2 - 4x - 30 = 0$

18.  $3x^2 + 6x - 50 = 0$

19.  $2x^2 - 7x + 10 = 0$

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**Use the quadratic formula to solve each equation.**

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

21.  $x^2 + 11 = 6x$

22.  $2x^2 = -1 - 4x$

## Solving Equations

Use a graphical method to find all real solutions of the equation, approximating when necessary.

23.  $x^3 + 9 = 3x^2 + 6x$

24.  $\sqrt{x^4 + x^2 - 3x + 1} = 0$

25.  $\frac{4}{x+2} - \frac{3}{x+1} = 0$

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Find all *real exact* solutions algebraically. Make sure to check for extraneous solutions.

26.  $|x + 2| = 4$

27.  $|2x - 1| = x + 4$

28.  $\frac{x^2 - 6x + 8}{x - 1} = 0$

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29.  $\frac{x^2 - x - 2}{x - 2} = 0$

---

30.  $\sqrt{x - 1} = 2 - x$

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31.  $\sqrt{x + 1} + \sqrt{x - 1} = 1$

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32.  $\sqrt[3]{1 - x^2} = -2$

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33.  $|x^2 + x - 4| \leq 2$

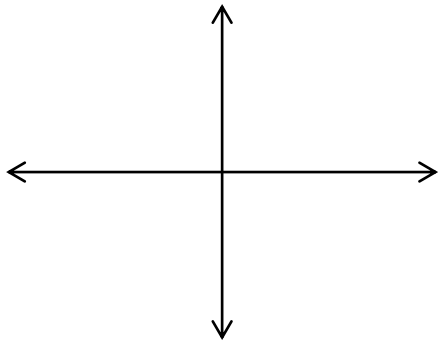
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34.  $\left| \frac{x^2 - x - 2}{x + x - 2} \right| > 3$

## Parent Function Graphs

Graph the following. Then state the domain and range.

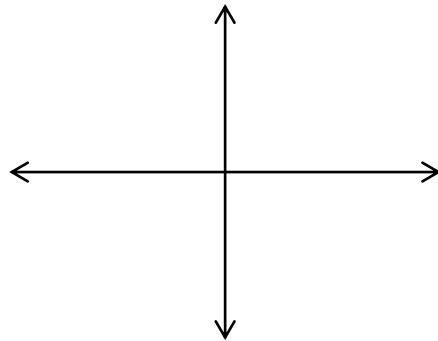
35.  $y = 3\sqrt{x} - 2$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

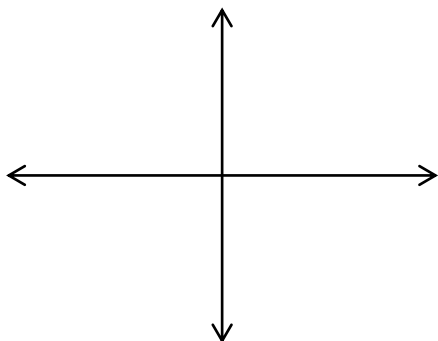
36.  $y = (x + 4)^3 + 3$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

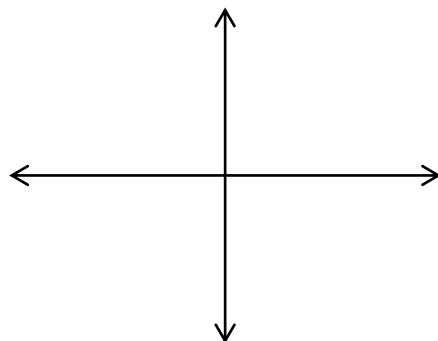
37.  $y = -(x - 1)^2 + 5$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

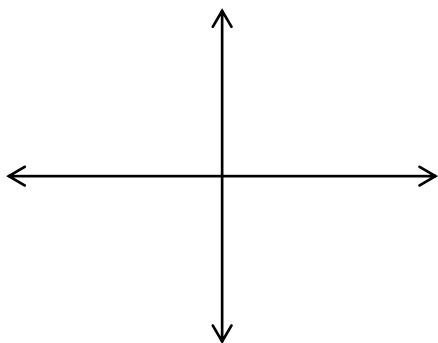
38.  $y = |3x - 6| - 4$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

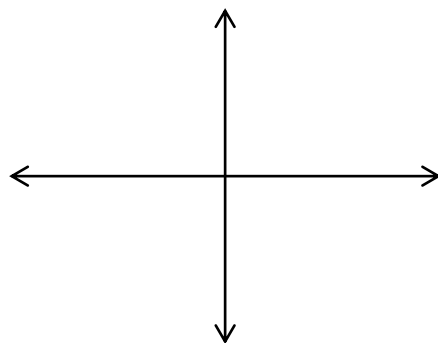
39.  $y = \frac{5}{x-3} + 2$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

40.  $y = \sqrt[3]{-\frac{1}{2}x}$

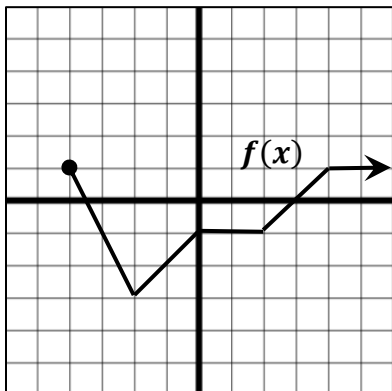


Domain: \_\_\_\_\_

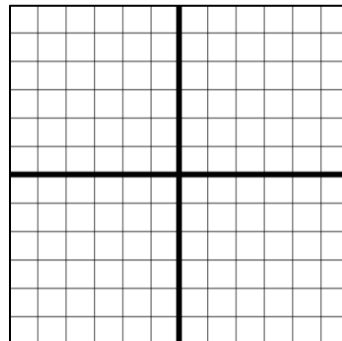
Range: \_\_\_\_\_

## Parent Function Graphs Continued

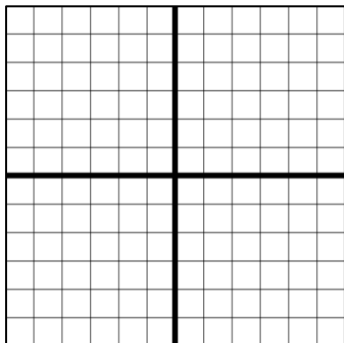
Use the graph of the function  $f(x)$  below to graph the other functions



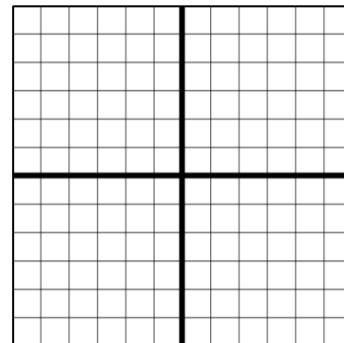
41.  $g(x) = -2f(x)$



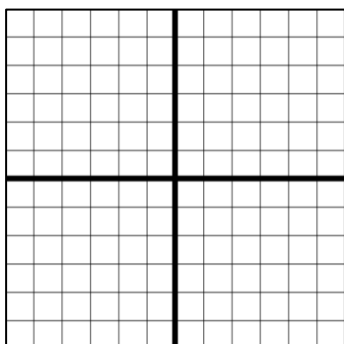
42.  $h(x) = f(2x) + 3$



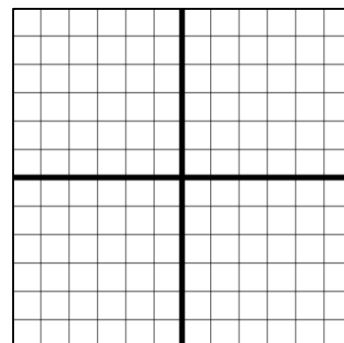
43.  $k(x) = f(x - 2) - 1$



44.  $m(x) = f(-x + 1) + 2$



45.  $n(x) = \frac{1}{2}f(x) + \frac{1}{2}$



State the domain and range of the following functions from above.

46. Domain of  $f(x)$ : \_\_\_\_\_

47. Domain of  $m(x)$ : \_\_\_\_\_

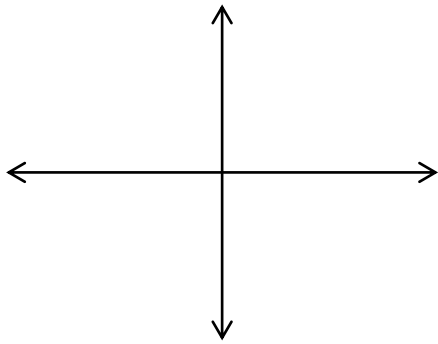
Range of  $f(x)$ : \_\_\_\_\_

Range of  $m(x)$ : \_\_\_\_\_

## Graphs of Rational Functions

Graph the following. Mark all asymptotes, intercepts, holes, etc. Then state the domain and range.

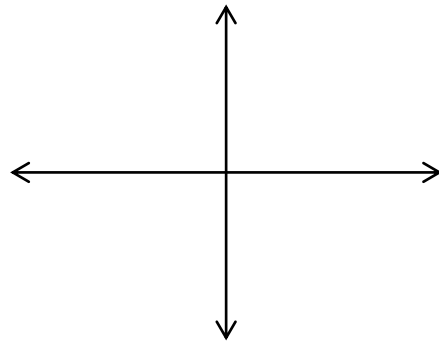
48.  $y = \frac{3x-4}{x+2}$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

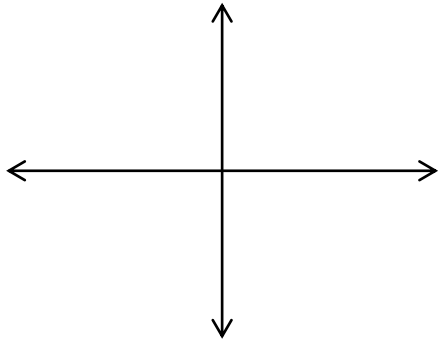
49.  $y = \frac{x-1}{x^2-16}$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

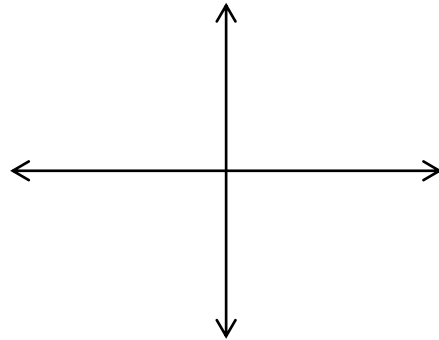
50.  $y = \frac{2x^2+x-6}{x^2+6x+8}$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

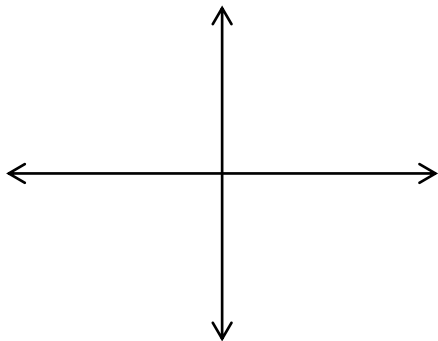
51.  $y = \frac{x^2+5x+6}{x-1}$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

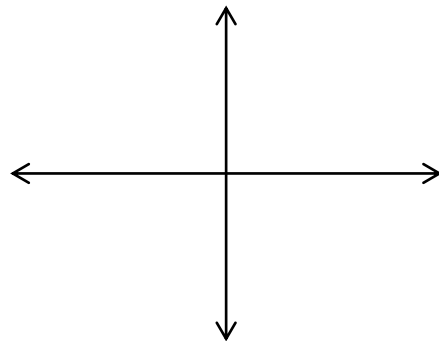
52.  $y = \frac{(1-3x)(x+5)(x-2)}{(x+5)(x+2)(x-3)}$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

53.  $y = \frac{x^2+8x+16}{x+4}$



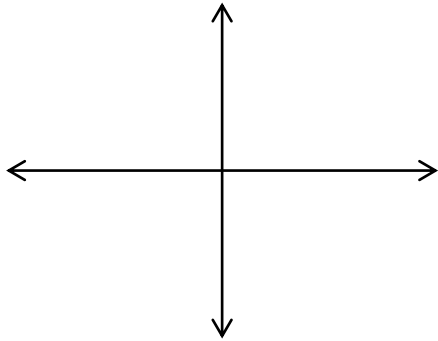
Domain: \_\_\_\_\_

Range: \_\_\_\_\_

## Graphs of Exponential Functions and Logarithms

Graph the following. Clearly mark all asymptotes and state the domain and range.

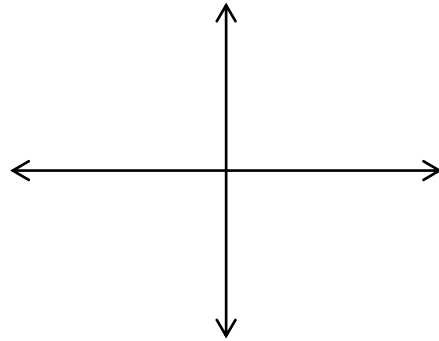
54.  $y = 3e^x - 2$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

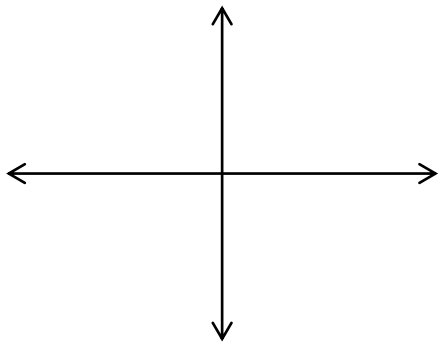
55.  $y = \log_3(x + 5) + 1$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

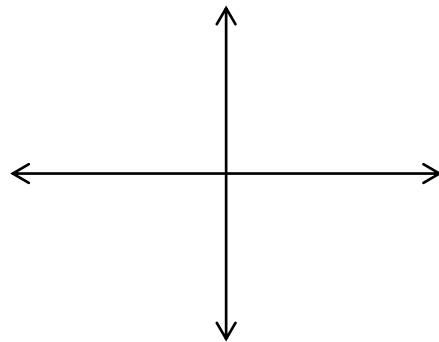
56.  $y = (2)^{\frac{1}{2}(x-3)}$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

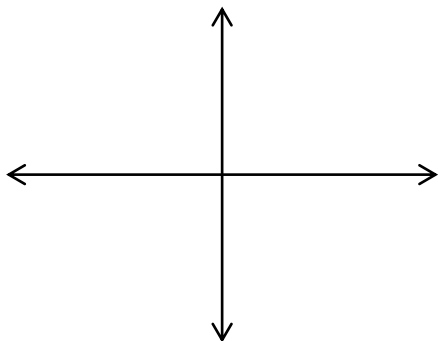
57.  $y = -\log(-x)$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

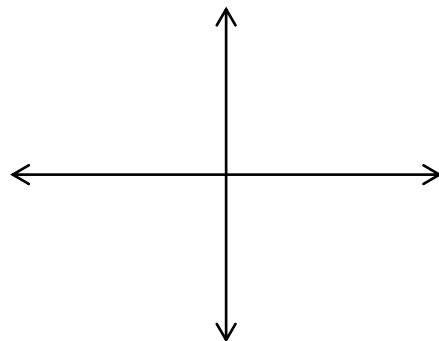
58.  $y = 4\left(\frac{1}{5}\right)^{x-1} + 3$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

59.  $y = 3\log_{1/2}(3 - x) + 1$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_



## *Solving Exponential and Logarithmic Equations*

Find all *real exact* solutions algebraically. Make sure to check for extraneous solutions.

$$60. 4^{5x} = 16^{2x-1}$$

$$61. 3^x + 3 = 30$$

$$62. 2^{x^2+5x} = \frac{1}{16}$$

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$$63. \log(2x + 5) = \log(x + 8)$$

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$$64. \log_3(x - 8) = \log_3(2x - 9)$$

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$$65. \ln(3x - 5) = \ln 11 + \ln 2$$

---

$$66. 5^x = 4$$

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$$67. 4^{3x-1} = 3^{x-2}$$

---

$$68. (3)^{2x} - 4(3)^x + 3 = 0$$

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$$69. 2 \log_5(x) = 3 \log_5(4)$$

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$$70. \log_2(x) + \log_2(x - 4) = 5$$

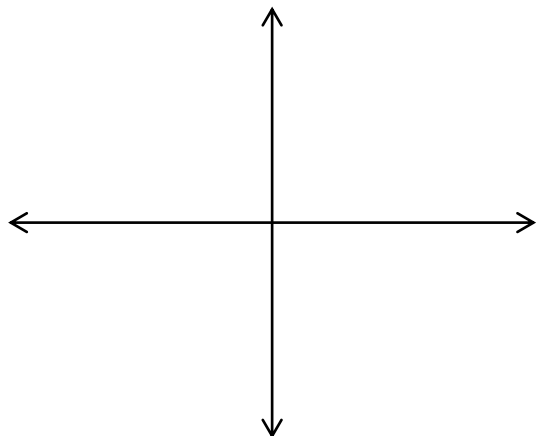
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$$71. \ln(x + 9) + \ln(x) = 1$$

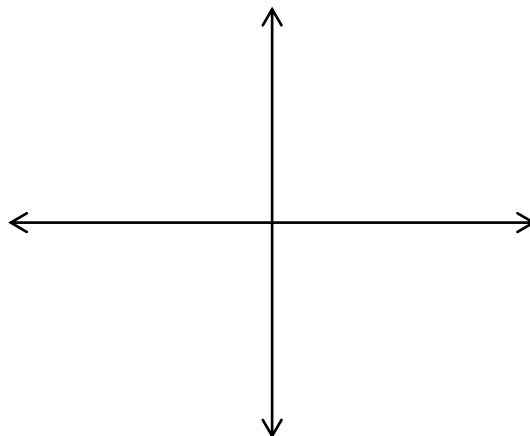
## Graphs of Conic Sections

Graph the following. Then clearly mark all vertices, covertices, foci, asymptotes, etc.

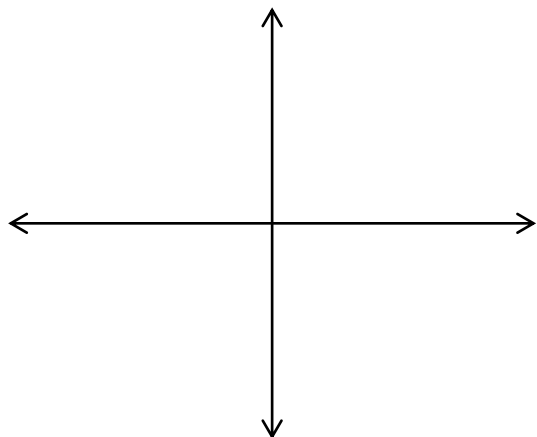
72.  $x^2 + y^2 = 9$



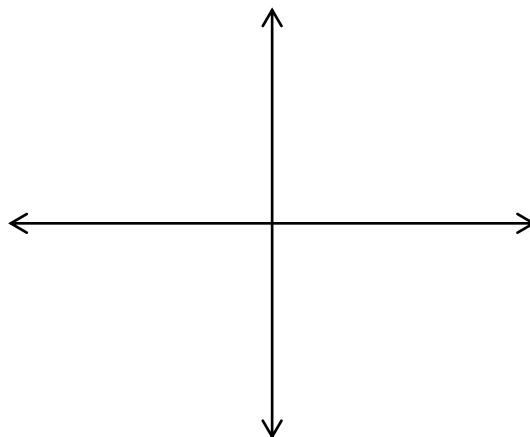
73.  $\frac{x^2}{16} + \frac{y^2}{36} = 1$



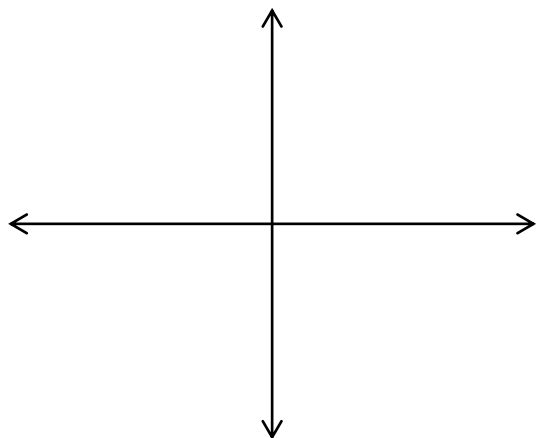
74.  $\frac{y^2}{9} - \frac{x^2}{25} = 1$



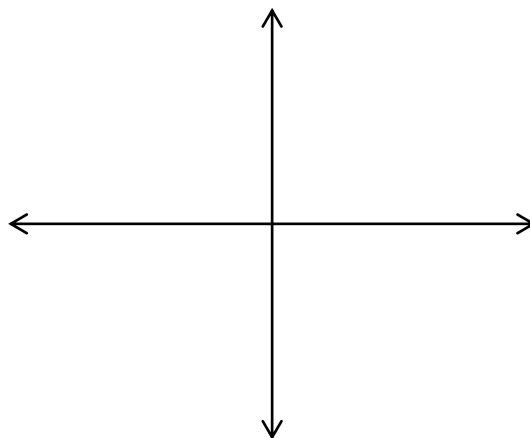
75.  $y^2 = 36x$



76.  $\frac{(x-3)^2}{49} - (y+2)^2 = 1$



77.  $\frac{(y-4)^2}{25} + \frac{(x+1)^2}{9} = 1$



## ***Right Triangle Trigonometry***

**Using a calculator, find the following. Round your answers to 3 decimal places.**

78.  $\cos(35^\circ)$

79.  $\tan(52^\circ)$

80.  $\sin(18^\circ)$

---

81.  $\tan(78^\circ)$

---

82.  $\sin(21^\circ)$

---

83.  $\cos(4^\circ)$

---

**Using special triangles, find the exact value of the following.**

84.  $\sin(30^\circ)$

85.  $\cos(45^\circ)$

86.  $\tan(60^\circ)$

---

87.  $\cos(30^\circ)$

---

88.  $\sin(60^\circ)$

---

89.  $\tan(45^\circ)$