

I. Simplify. Identify the zeros, vertical asymptotes, horizontal asymptotes, holes and sketch each rational function. Show the work that leads to your graph.

1) $f(x) = \frac{x^3-x}{2x^3-8x}$

2) $f(x) = \frac{x^2-4x-32}{x^2-16}$

3) $f(x) = \frac{x-4}{x^2-3x-4}$

Zeros: _____

Zeros: _____

Zeros: _____

VA: _____

VA: _____

VA: _____

HA: _____

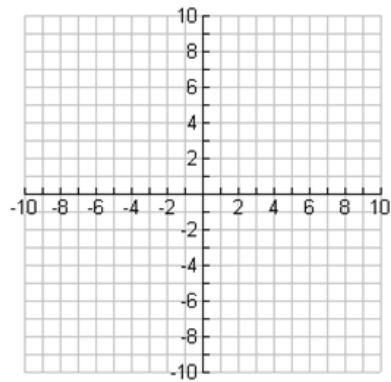
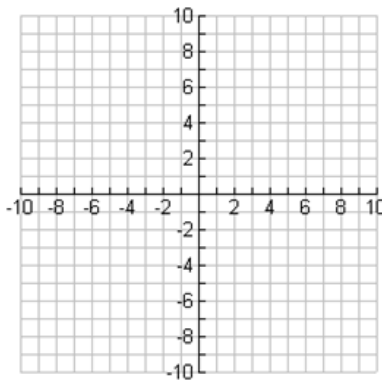
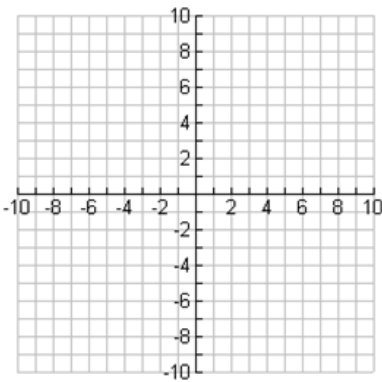
HA: _____

HA: _____

Holes: _____

Holes: _____

Holes: _____



Show work:

II. Complete the following identities:

1) $\sin^2 x + \cos^2 x =$ _____

2) $\cos^2 x =$ _____

3) $\cot^2 x + 1 =$ _____

4) $\sin^2 x =$ _____

5) $\sin(2x) =$ _____

6) $\cos(2x) =$ _____

7) $\tan^2 x + 1 =$ _____

III. Simplify each expression:

1) $\frac{1}{x+h} - \frac{1}{x}$

2) $\frac{\frac{2}{x^2}}{\frac{10}{x^5}}$

3) $\frac{\frac{1}{x+3} - \frac{1}{3}}{x}$

4) $\frac{2x}{x^2-6x+9} - \frac{1}{x+1} - \frac{8}{x^2-2x-3}$

5) $\frac{2 - \frac{4}{x+2}}{5 + \frac{10}{x+2}}$

6) $\frac{\frac{x}{x+1} - \frac{1}{x}}{\frac{x}{x+1} + \frac{1}{x}}$

7) $\frac{x}{\sqrt{x+9}-3}$
(Hint: Rationalize the denominator)

8) $\frac{\sqrt{x+h}-\sqrt{x}}{h}$
(Hint: Rationalize the numerator)

IV. Solve for z:

1) $4x + 10yz = 0$

2) $y^2 + 3yz - 8z - 4x = 0$

V. Expand and Simplify:

1) $\sum_{n=0}^4 \frac{n^2}{2} =$

2) $\sum_{n=1}^3 \frac{1}{n^3} =$

VI. Determine each of the following given that...

$$\begin{aligned} f(x) &= \{(3,5), (2,4), (1,7)\} \\ h(x) &= \{(3,2), (4,3), (1,6)\} \end{aligned}$$

$$\begin{aligned} g(x) &= \sqrt{x-3} \\ k(x) &= x^2 + 5 \end{aligned}$$

1) $(f \circ g)(3) =$

2) $(g \circ k)(7) =$

3) $\frac{1}{f(x)} =$

4) $(kg)(x) =$

5) $(f + h)(1) =$

6) $(k - g)(5) =$

7) $f^{-1}(x) =$

8) $k^{-1}(x) =$

VII. Miscellaneous: Follow directions for each problem.

1) Evaluate $\frac{f(x+h)-f(x)}{h}$ and simplify if $f(x) = x^2 - 2x$.

2) Expand $(2x - y)^5$ using Pascal's Triangle.

3) Simplify $x^{\frac{3}{2}}(x + x^{\frac{5}{2}} - x^2)$

4) Eliminate the parameter and write a rectangular equation for $x = t^2$ and $y = 2t$.

VIII. Simplify:

1) $\frac{\sqrt{x}}{x}$

2) $e^{\ln 3}$

3) $e^{1+\ln x}$

4) $\ln 1$

5) $\ln e^7$

6) $\log_3 \left(\frac{1}{3}\right)$

7) $\log_{\frac{1}{2}} 8$

8) $\ln \left(\frac{1}{2}\right)$

9) $e^{3 \ln x}$

10) $\frac{4xy^{-2}}{12x^{-\frac{1}{3}}y^{-5}}$

11) $27^{\frac{2}{3}}$

12) $(5a^{\frac{2}{3}})(4a^{\frac{3}{2}})$

13) $(16a^{\frac{5}{3}})^{\frac{3}{2}}$

14) $\frac{3(n+1)!}{5n!}$

IX. Using the point-slope form $y - y_1 = m(x - x_1)$, write an equation for the line:

1) with slope -2, containing the point (3,4) _____

2) containing the points (1,-3) and (-5,2) _____

3) with slope 0 , containing the point (4,2) _____

4) perpendicular to the line $3y + 2x = 6$, containing the point (3,4) _____

5) parallel to the line $y - 3x = 7$, containing the point (3,4) _____

X. Without a calculator, determine the exact value of each expression:

1) $\sin \pi$

2) $\sin \frac{\pi}{2}$

3) $\sin \frac{3\pi}{4}$

4) $\cos 0$

5) $\cos \frac{3\pi}{4}$

6) $\cos \frac{\pi}{3}$

7) $\tan \frac{7\pi}{4}$

8) $\tan \frac{\pi}{6}$

9) $\cot \frac{5\pi}{6}$

10) $\sec \frac{4\pi}{3}$

11) $\csc \frac{2\pi}{3}$

12) $\cos \left(\sin^{-1} \frac{1}{2} \right)$

13) $\arcsin 1$

14) $\arctan 1$

15) $\sin^{-1} \left(\sin \frac{7\pi}{6} \right)$

XI. Determine all points of intersection:

1) Line $x + y = 8$ and line $4x - y = 7$

2) Parabola $y = x^2 + 3x - 4$ and line $y = 5x + 11$

3) Parabola $y = 4 - x^2$ and parabola $y = x^2 + 2x$

XII. For #1-6, determine the function's domain and range. For #7-10, evaluate.

$$f(x) = x - 4$$

$$g(x) = x^2 - 4$$

$$h(x) = \ln x$$

<u>Function</u>	<u>Domain</u>	<u>Range</u>
1) $\ln(f(x))$		
2) $\sqrt{g(x)}$		
3) $f(g(x))$		
4) $g(f(x))$		
5) $h(x)$		
6) $h^{-1}(x)$		

7) $g(f(7))$

8) $f^{-1}(g(2))$

9) $h(1)$

10) $h^{-1}(1)$

XIII. Solve for x , where x is a real number. Show the work that leads to your solution.

1) $x^2 + 3x - 4 = 14$

2) $\frac{x^4-1}{x^3} = 0$

XIV. Given the vectors $\mathbf{v} = -2\mathbf{i} + 5\mathbf{j}$ and $\mathbf{w} = 3\mathbf{i} + 4\mathbf{j}$, determine:

1) $\frac{1}{2}\mathbf{v}$

2) $\mathbf{w} - \mathbf{v}$

3) length of \mathbf{w}

XV. Express each of these fractions as the sum of two or more fractions with simpler denominators. (This is called partial fraction decomposition.)

1) $\frac{x}{x^2+5x+6}$

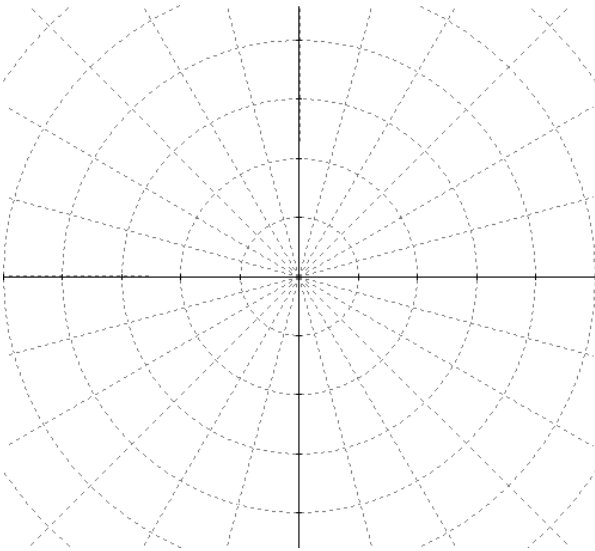
2) $\frac{1}{x^2-3x+2}$

3) $\frac{2x^2+2}{4-x^2}$

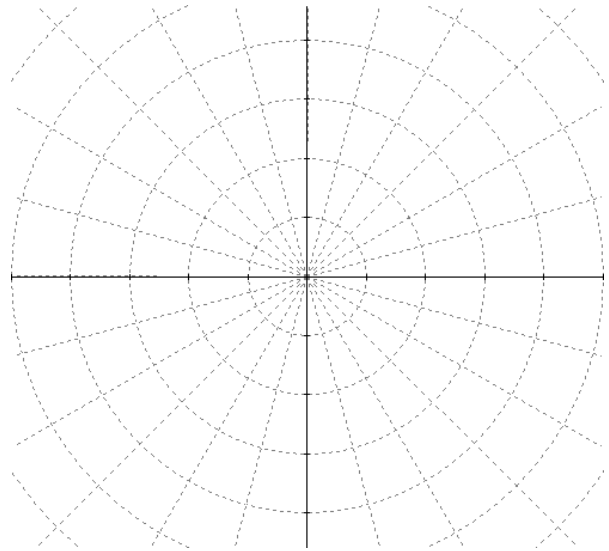
4) $\frac{x^3+x^2+x}{x^2+2x+1}$

XVI. Sketch a graph of each.

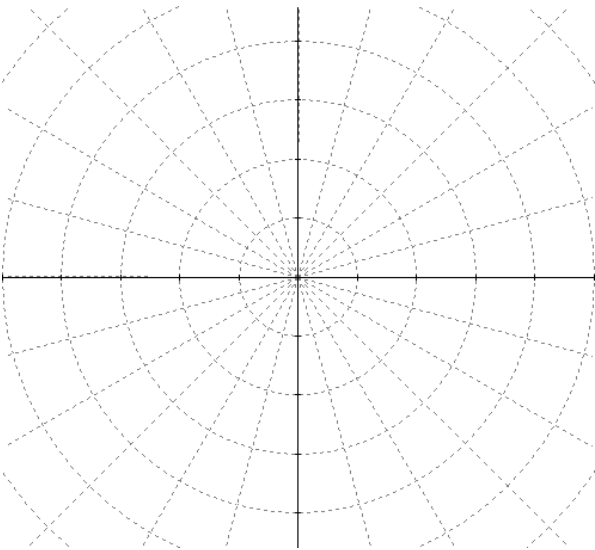
1) $r = 2$



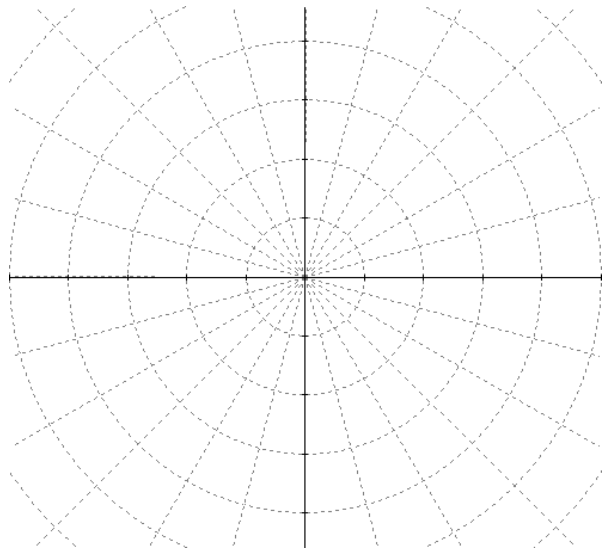
2) $r = 3 \sec \theta$



3) $r = 1 + \sin \theta$

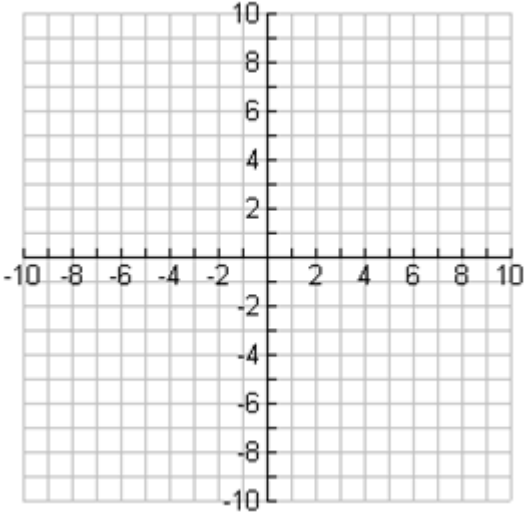


4) $r = 2 \cos(3\theta)$



XVII. Graph each function. Give its domain and range.

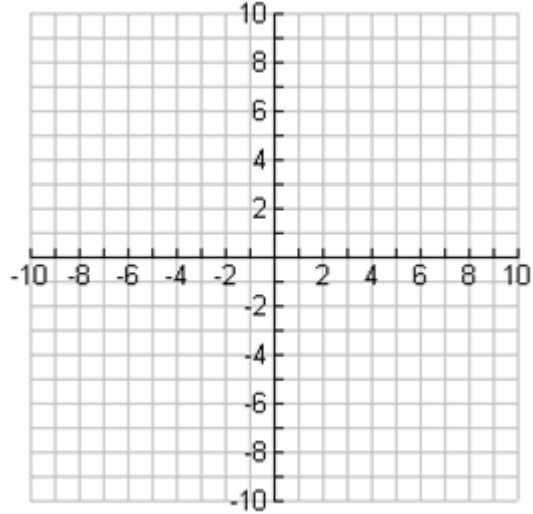
1) $y = \sin x$



Domain: _____

Range: _____

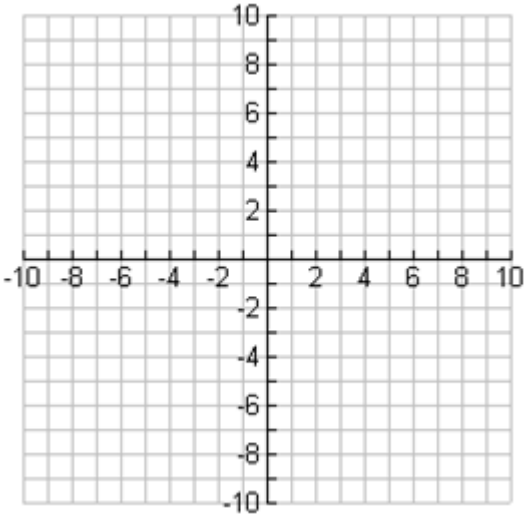
2) $y = e^x$



Domain: _____

Range: _____

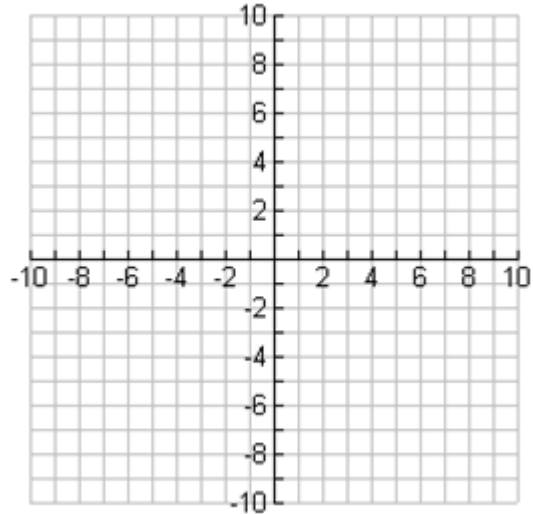
3) $y = \sqrt{x}$



Domain: _____

Range: _____

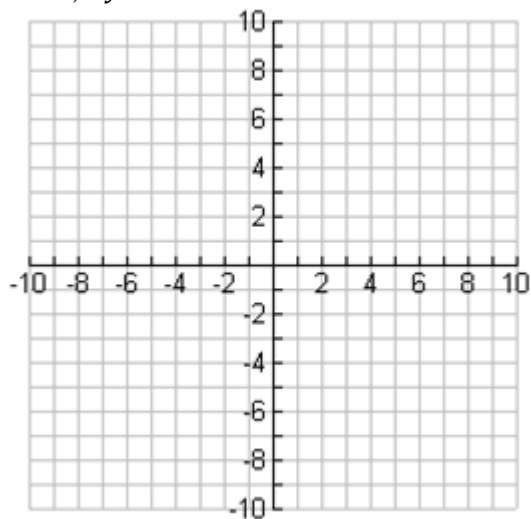
4) $y = \sqrt[3]{x}$



Domain: _____

Range: _____

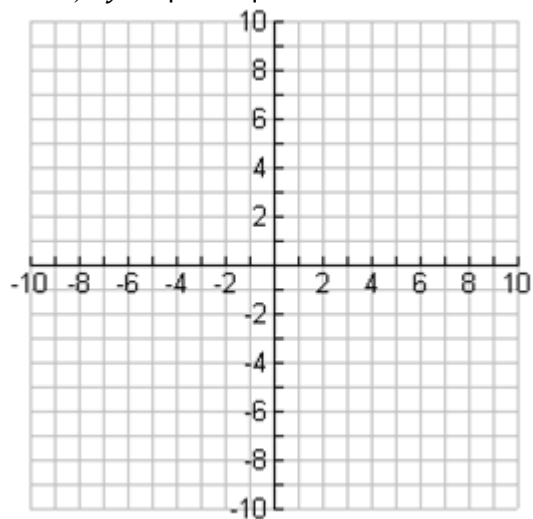
5) $y = \ln x$



Domain: _____

Range: _____

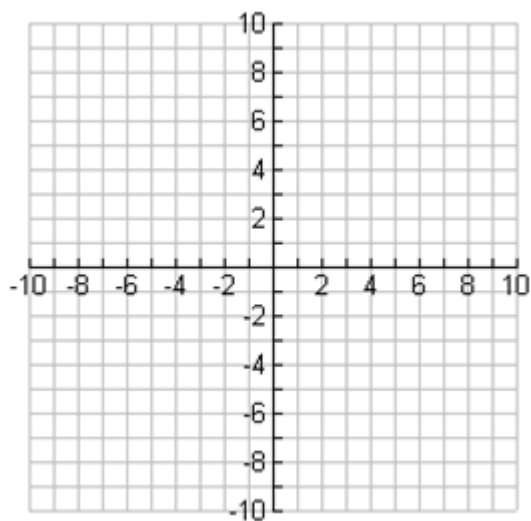
6) $y = |x + 3| - 2$



Domain: _____

Range: _____

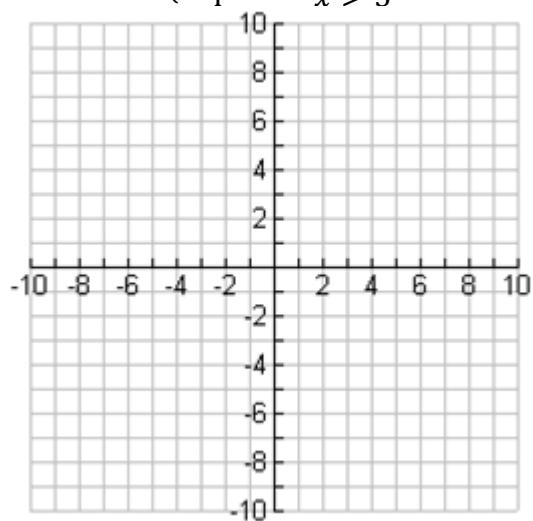
7) $y = \frac{1}{x}$



Domain: _____

Range: _____

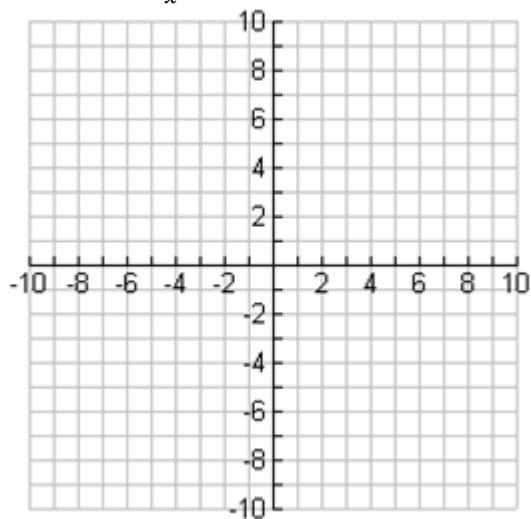
8) $y = \begin{cases} x^2 & x < 0 \\ x + 2 & 0 \leq x \leq 3 \\ 4 & x > 3 \end{cases}$



Domain: _____

Range: _____

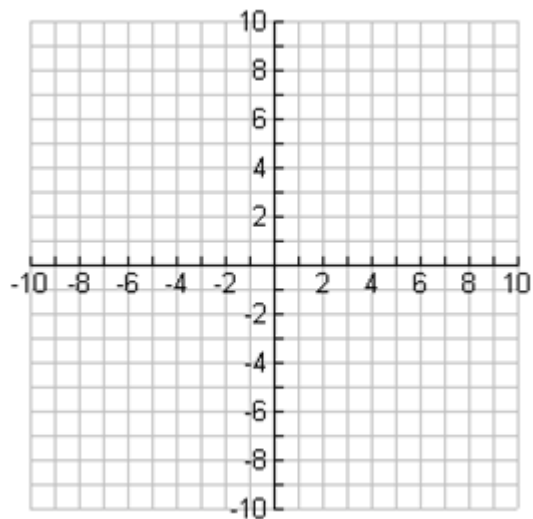
9) $y = \frac{1}{x^2}$



Domain: _____

Range: _____

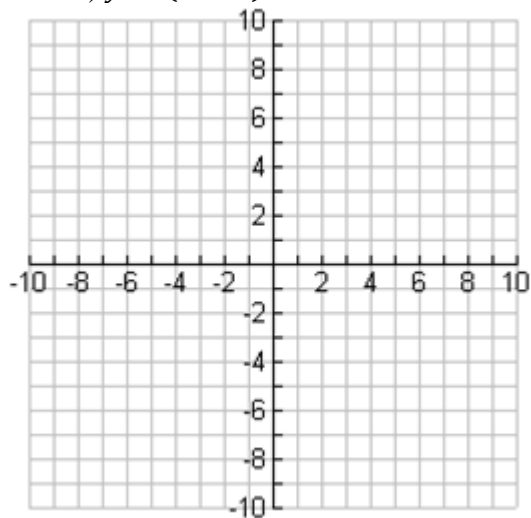
10) $y = \csc x$



Domain: _____

Range: _____

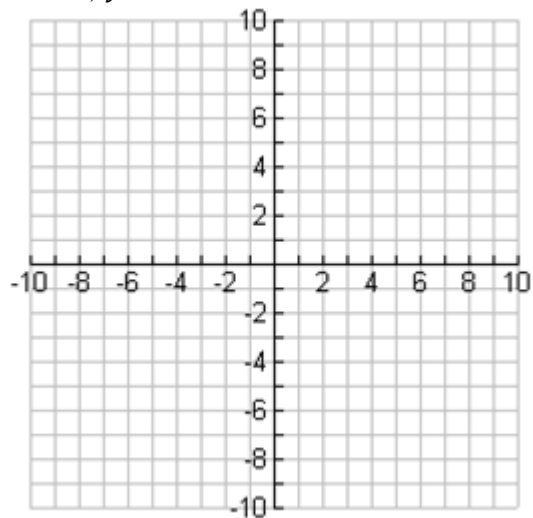
11) $y = (x + 2)^3 - 4$



Domain: _____

Range: _____

12) $y = \tan x$

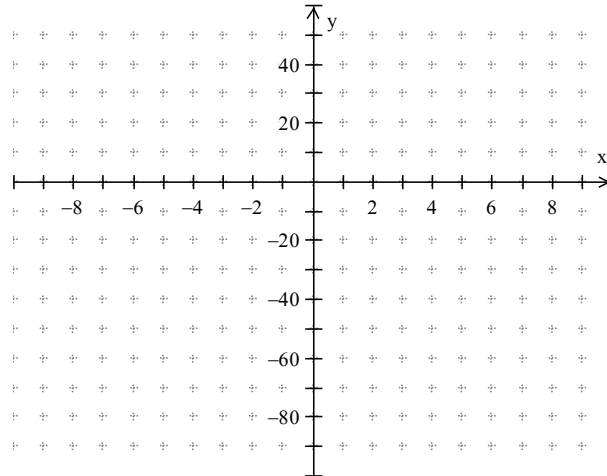


Domain: _____

Range: _____

XVIII. Answer the following questions with a graphing calculator. All answers should be accurate to 3 decimal places.

- 1) In your calculator, graph $f(x) = 2x^4 - 11x^3 - x^2 + 30x$ using a window size as follows: x min = -10, x max = 10, y min = -100, y max = 60. Sketch the result below.

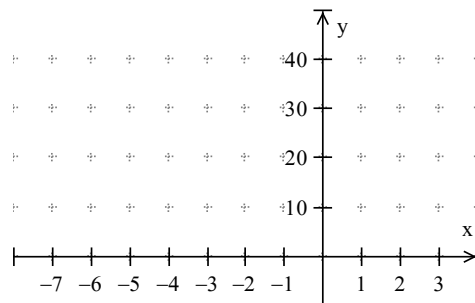


- 2) Find all roots (zeros) of $f(x)$. 3) Find all local maxima of $f(x)$. 4) Find all local minima of $f(x)$.

- 5) Use the table function in your calculator to complete the table.

x	-2	-1	-0.2	1	1.25	2.218	4.947
$f(x)$							

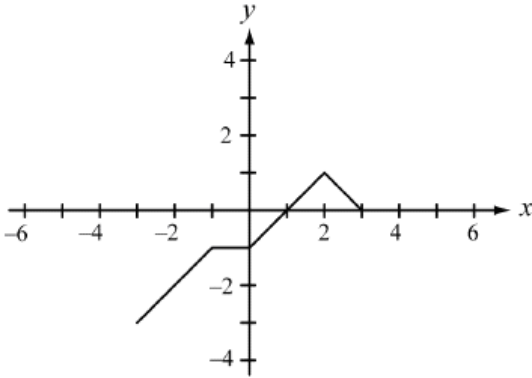
- 6) In your calculator, graph $g(x) = x^3 + 5x^2 - 7x + 2$ and $h(x) = 0.2x^2 + 10$ using a window size: x min = -8, x max = 4, y min = -10, y max = 50. Sketch the result below.



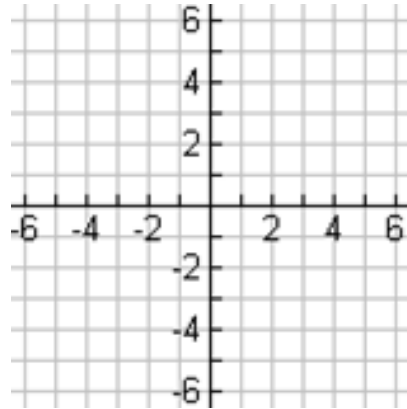
- 7) Find all points of intersection of $g(x)$ and $h(x)$.

XIX. Function f , defined on the closed interval $[-3,3]$, is graphed to the lower left:

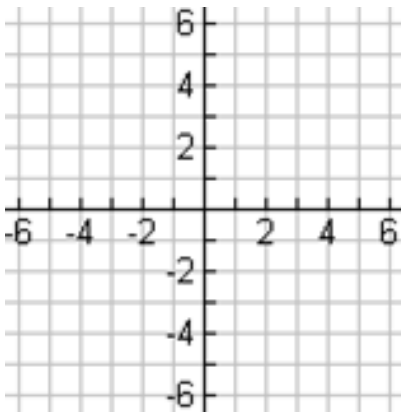
Graph of $y = f(x)$



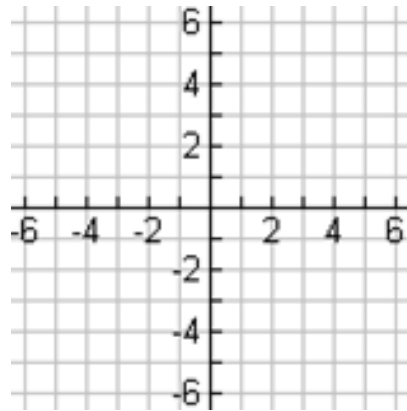
1) Sketch $y = |f(x)|$.



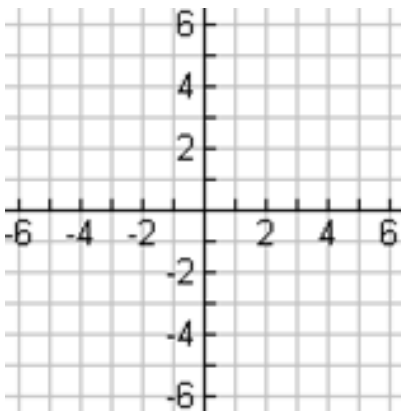
2) Sketch $y = f(-x)$.



3) Sketch $y = f\left(\frac{x}{2}\right)$.



4) Sketch $y = f(x - 1) + 2$



5) Sketch $y = f(|x|)$.

