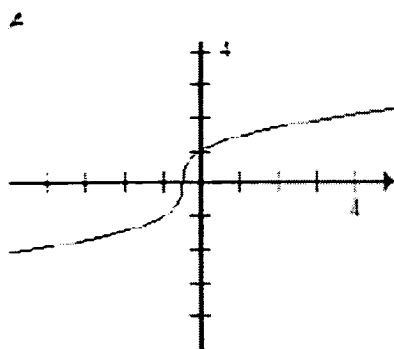
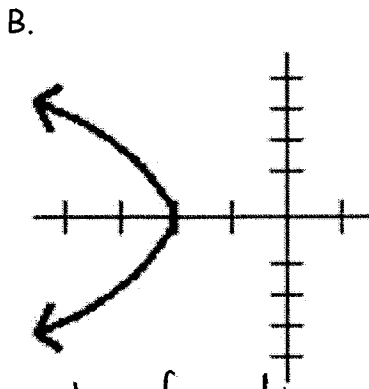


ICM Functions Test Review Worksheet

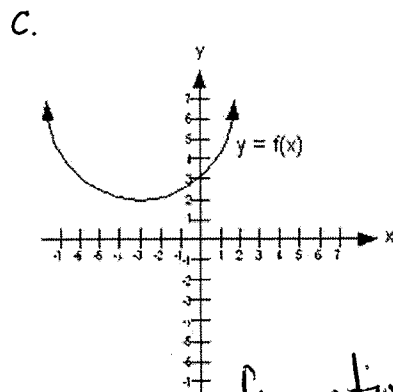
1. For each relation, determine if it is a function, and determine if it is one-to-one.



function
one-to-one

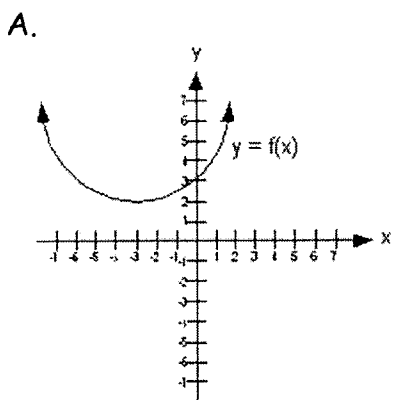


not a function
one-to-one

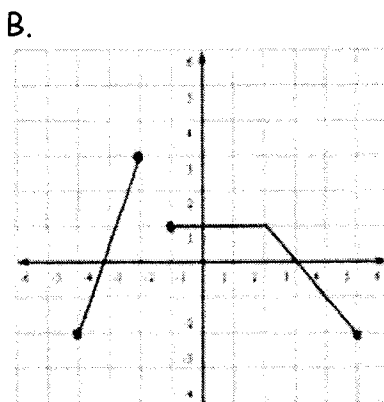


function
not one-to-one

2. Give the domain and range of each function.



D: $(-\infty, \infty)$
R: $[2, \infty)$



D: $[-4, -2] \cup [-1, 5]$
R: $[-2, 3]$

C.

$$g(x) = \sqrt[3]{6-x} \quad D: (-\infty, \infty)$$

$$R: (-\infty, \infty)$$

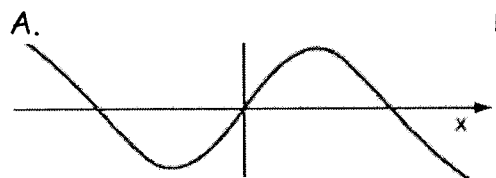
D.

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

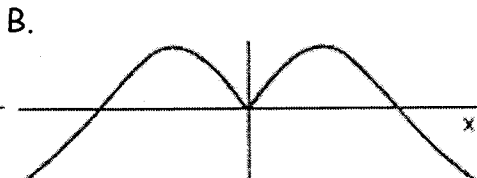
$$D: (-\infty, 8) \cup (8, \infty)$$

$$R: (-\infty, 2) \cup (2, \infty)$$

3. Determine if each function is even, odd, or neither.



odd



even

C.

$$f(x) = \frac{x^2+4}{x^3-x} \quad \text{odd}$$

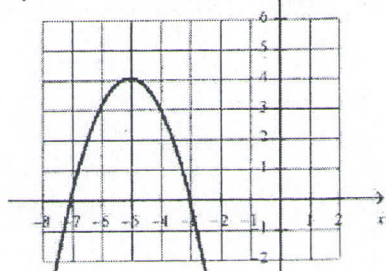
D.

$$f(x) = x^5 - 3x^3 + 7$$

neither

4. Describe the transformations on the graph of each parent function to obtain the specified function.

A.



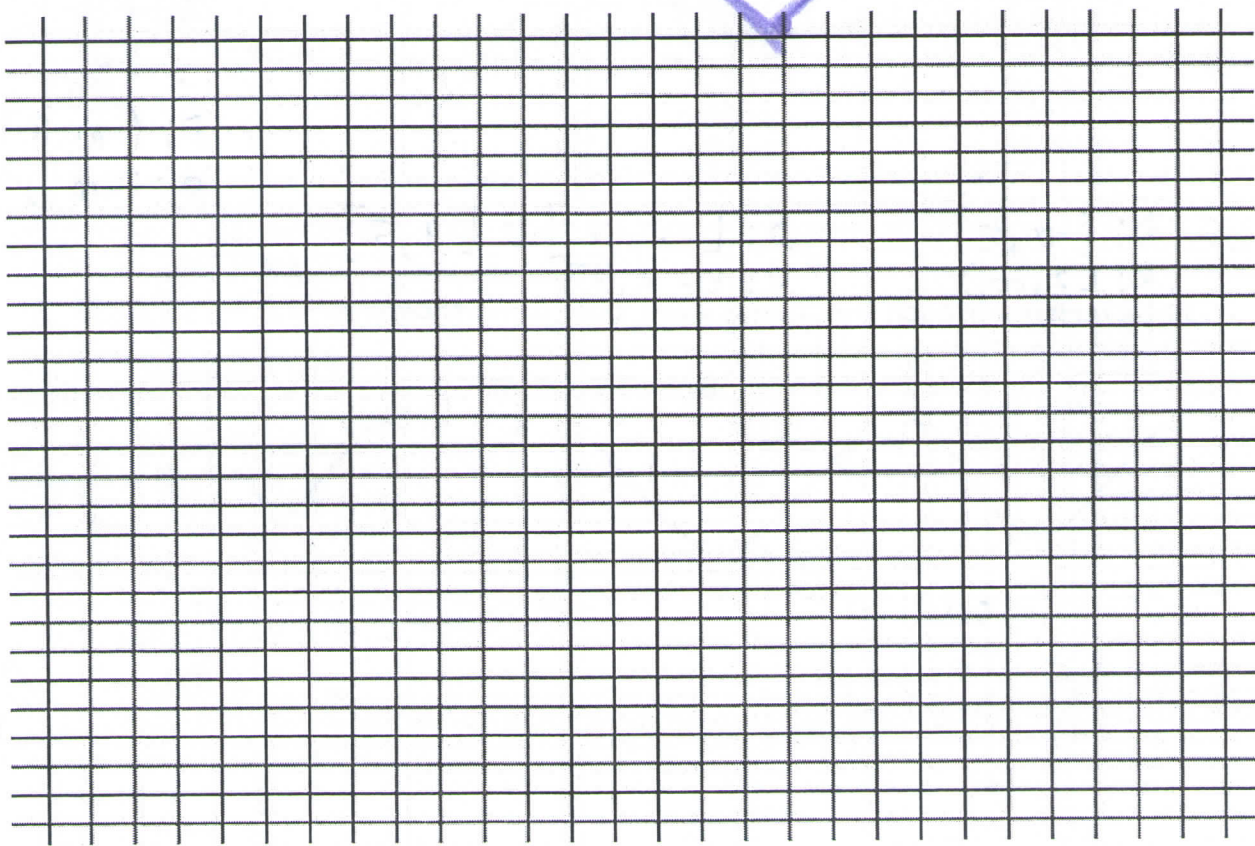
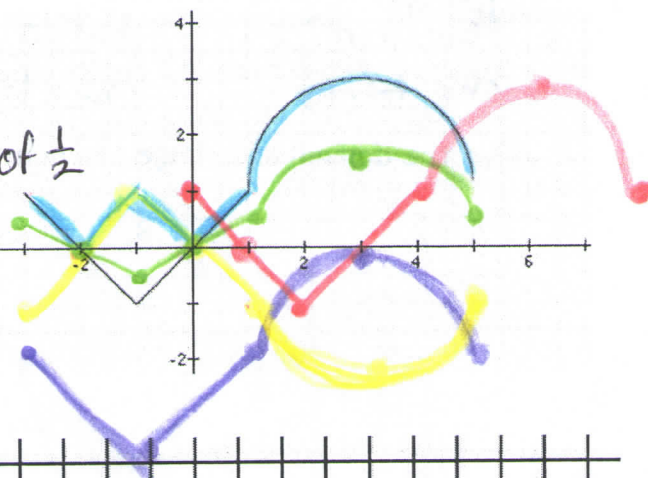
B. $f(x) = -2\sqrt{x+1} - 3$

horiz shift left 1
 vert. stretch by a factor of 2
 refl over x-axis
 vert. shift down 3

honz. shift left 5, reflect over x-axis,
 vert. shift up 4

5. Given the graph of $y = f(x)$, sketch each transformation specified.

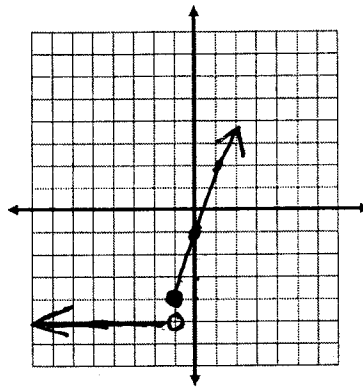
- A. $f(x - 3)$ right 3
- B. $f(x) - 3$ down 3
- C. $-f(x)$ reflect over x-axis
- D. $\frac{1}{2}f(x)$ vert. shrink by a factor of $\frac{1}{2}$
- E. $|f(x)|$ partial reflection over the x-axis



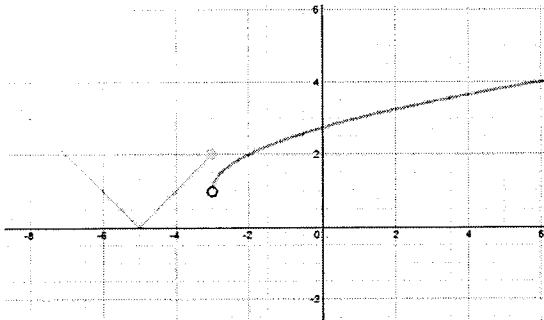
ICM Functions Test Review Worksheet

6. Graph the piecewise function.

$$f(x) = \begin{cases} 3x - 1, & x \geq -1 \\ -5, & x < -1 \end{cases}$$

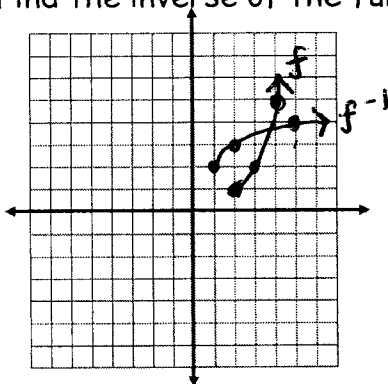


7. Write a piecewise function for the graph.



$$f(x) = \begin{cases} |x+5|, & x \leq -3 \\ \sqrt{x+3} + 1, & -3 < x \leq 6 \end{cases}$$

8. Find the inverse of the function $f(x) = (x - 2)^2 + 1$ for $x \geq 2$. Graph $f(x)$ and $f^{-1}(x)$.



$$f^{-1}(x) = \sqrt{x-1} + 2, \quad x \geq 1$$

9. Describe the end behavior of the function $f(x) = -x^6 + 5x^5 - 2x^3 + 4$.

$$\lim_{x \rightarrow -\infty} f(x) = -\infty \quad \lim_{x \rightarrow \infty} f(x) = \infty \quad (\text{as } x \rightarrow \pm\infty, \text{ both ends } \rightarrow -\infty)$$

10. For each polynomial, give the degree, find the roots, and sketch a graph.

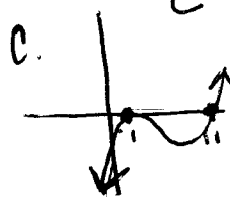
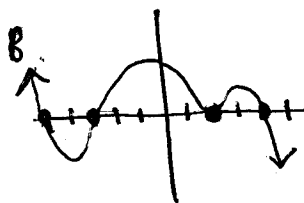
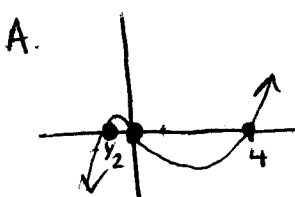
A. $f(x) = 2x^3 - 7x^2 - 4x$

B. $f(x) = -(x - 2)^2(x - 4)(x + 3)(x + 5)$

C. $f(x) = x^3 - 13x^2 + 23x - 11$

poly.	degree	roots
A	3	0, $-\frac{1}{2}$, 4
B	5	2*, 4, -3, -5
C	3	1*, 11

* multiplicity of 2



11. Is $x + 5$ a factor of $x^3 + 9x^2 + 23x + 15$? Is $x - 1$ a factor?

yes no

12. Find the asymptotes:

A. $f(x) = \frac{2x^2 + 5x + 3}{x^3 - 9x}$ H.A. $y = 0$ V.A. $x = 0, x = 3, x = -3$

B. $g(x) = \frac{2x^2 + 5x + 3}{x - 1}$ H.A. none V.A. $x = 1$ slant $y = 2x + 7$

13. Sketch a graph of the rational function described below:

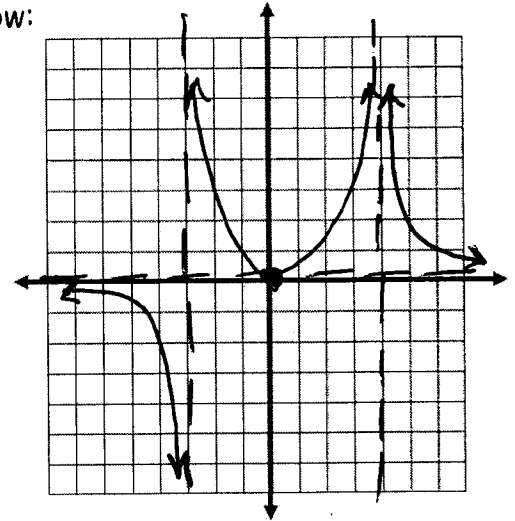
has an x- and y-intercept at the origin

has vertical asymptotes $x = -3$ and $x = 4$

has horizontal asymptote $y = 0$

as $x \rightarrow 4^+$, $y \rightarrow \infty$ as $x \rightarrow 4^-$, $y \rightarrow \infty$

as $x \rightarrow -3^+$, $y \rightarrow \infty$ as $x \rightarrow -3^-$, $y \rightarrow -\infty$



14. Powell Power Company charges .09 cents per kilowatt-hour for the first 200 kWh. The company charges .11 cents per kilowatt-hour for all electrical usage in excess of 200 kWh. There is a standard \$8.52 monthly usage fee.

A. Write a piecewise function for the situation.

B. How much does a customer who uses 150 kWh pay? \$22.02

C. How much does a customer who uses 275 kWh pay? \$34.77

$$f(x) = \begin{cases} 8.52 + .09x, & 0 \leq x \leq 200 \\ 8.52 + 200(.09) + (x-200)(.11), & x > 200 \end{cases}$$

15. A super-duper bottle rocket is launched vertically into the air from the ground at an initial velocity of 80 feet per second. Find the highest point reached by the firework just as it explodes. Find the time the shell hits the ground.

$$s(t) = -16t^2 + 80t \quad 100 \text{ ft} \quad 5 \text{ sec}$$

16. In the town of Powellville, natural gas is the primary resource. The table shows the amount of natural gas produced each year. Find a quadratic regression and use it to predict the year that gas production will be zero.

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016
Natural Gas Produced (millions of m ³)	1.6	2.1	3.0	4.1	4.3	4.4	3.6	2.1	0.5

$$y = -.211x^2 + 1.641x + 1.078 \quad \text{zero at } x = 8.380 \Rightarrow 2016$$