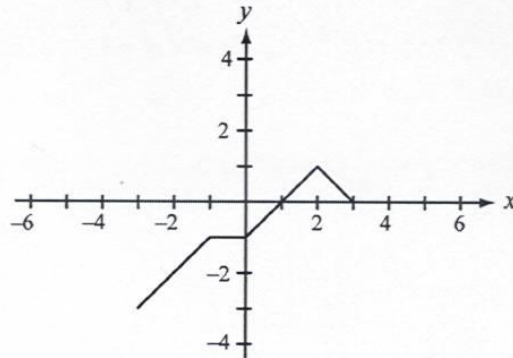


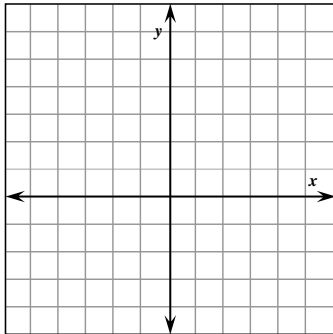
ICMAB Problem Set 2 Fall 2016

1. A function f is defined on the closed interval from -3 to 3 and has the graph shown below.

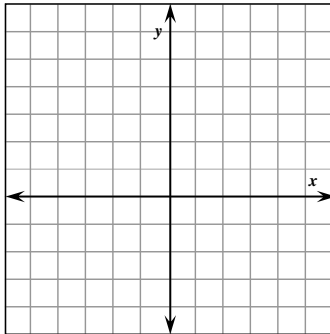


- Sketch the entire graph of $y = |f(x)|$.
- Sketch the entire graph of $y = f(|x|)$.
- Sketch the entire graph of $y = f(-x)$.
- Sketch the entire graph of $y = f\left(\frac{1}{2}x\right)$.
- Sketch the entire graph of $y = f(x-1)$.

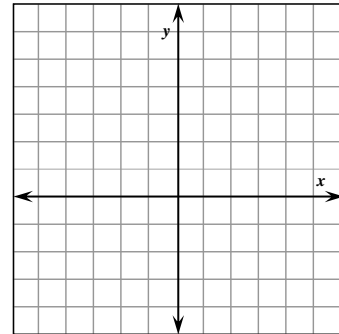
a.



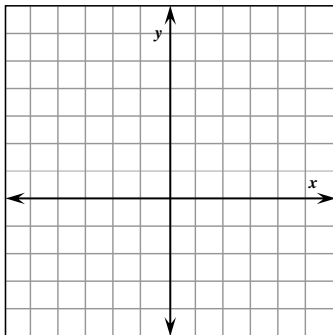
b.



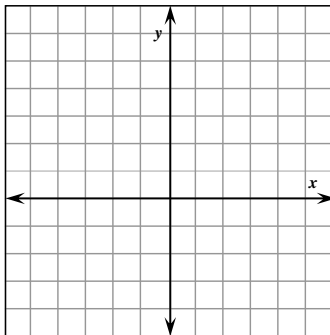
c.



d.



e.



2. A function f is defined for all real numbers and has the following three properties:
- $f(1) = 5$,
 - $f(3) = 21$, and
 - for all real values of a and b , $f(a + b) - f(a) = kab + 2b^2$ where k is a fixed real number independent of a and b . Use $a = 1$ and $b = 2$ to find the value of k .
3. Given $f(x) = x^3 - 6x^2 + 9x$ and $g(x) = 4$.
- Find the coordinates of the points common to the graphs of f and g .
 - Find all the zeros of f .
 - If the domain of f is limited to the closed interval $[0,2]$, what is the range of f ? Show your reasoning.
4. A manufacturer finds it costs him $x^2 + 5x + 7$ dollars to produce x tons of an item. At production levels above 3 tons, he must hire additional workers, and his costs increase by $3(x - 3)$ dollars on his total production. If the price he receives is \$13 per ton regardless of how much he manufactures and if he has a plant capacity of 10 tons, what level of output maximizes his profits?
5. Given two functions f and g defined by $f(x) = \tan(x)$ and $g(x) = \sqrt{2} \cos x$.
- Find the coordinates of the point of intersection of the graphs of f and g in the interval $0 < x < \frac{\pi}{2}$.
6. Given the function f defined by $f(x) = \ln(x^2 - 9)$.
- Describe the symmetry of the graph of f .
 - Find the domain of f .
 - Find all values of x such that $f(x) = 0$.
 - Write a formula for $f^{-1}(x)$, the inverse function of f , for $x > 3$.