Problem Set #3 (5 pts. each) Name________________________________

1. Given the function *f* defined by $f(x)=\dfrac{2x-2}{x^2+x-2}$

A. For what values of x is *f*(x) discontinuous? ____________________________

B. At each point of discontinuity found in part A determine whether *f*(x) has a limit, and if so, give the value of the limit.

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C. Write an equation for each vertical and horizontal asymptote to the graph of *f*. Justify each answer.

____________________________ (4 pts)

____________________________ (4 pts)

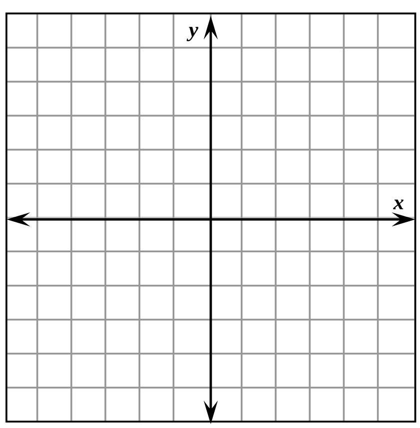
D. A rational function $g(x)=\dfrac{a}{b+x}$ is such that *g*(x) = *f*(x) wherever f is defined. Find the values of a and b.

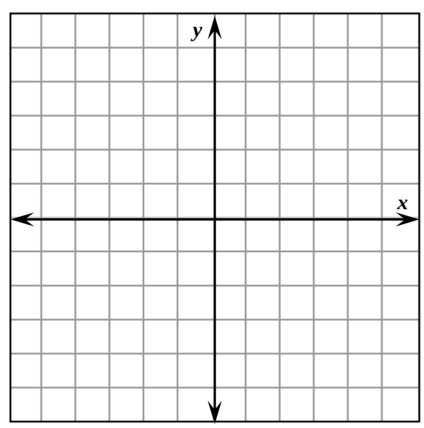
_______________ _______________

2. Given the function *f* where $f(x)=x^2-2x$ for all real numbers x.

A. Sketch the graph of y = | *f*(x) | (4 pts)

B. Sketch the graph of y = (*f*|(x) |) (4 pts)





C. Determine whether | *f*(x) | is continuous at x = 0. Justify your answer.

3. Find all the extrema in the interval $[0,2\pi]$ for $y=x-\cos(x)$. ____________________

4. Let p and q be real numbers and let f be the function defined by:

$$f(x) = \begin{cases} 1 + 2p(x-1) + (x-1)^2 & \text{if } x \le 1 \\ qx + p & \text{if } x > 1 \end{cases}$$, use the definition to show if *f*(x) continuous at x = 1.

A. Find the value of q, in terms of p, for which *f* is continuous at x = 1. ____________________

B. Find the values of p and q for which *f* is continuous at x = 1. ____________________

5. Given that f is the function defined $f(x) = \dfrac{x^3 - x}{x^3 - 4x}$

A. Find the $\lim\limits_{x \to 0} f(x) =$ ____________________

B. Find the zeros of *f*. ____________________

C. Write an equation for each vertical and each horizontal asymptote to the graph of *f*.

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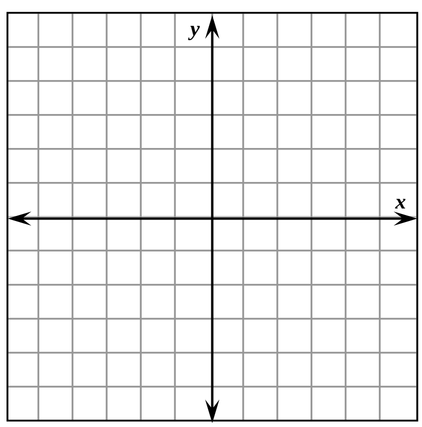
D. Describe the symmetry of the graph of *f*. Show work! (4 pts.)

E. Using the information found in the previous parts, sketch the graph of *f*. (4 pts.)



(4 pts. each)

6. Find the limit: $\lim\limits_{x \to -9} \dfrac{x^2 + 6x - 27}{x + 9}$ ____________________

7. Find the limit: $\lim\limits_{x \to 0} \dfrac{1 - \cos^2(x)}{x}$ ____________________

8. Find the limit: $\lim\limits_{x \to 6^-} \dfrac{|3x - 18|}{6 - x}$ ____________________

9. Find the limit: $\lim\limits_{x \to 1^-} \dfrac{-2}{x - 1}$ ____________________