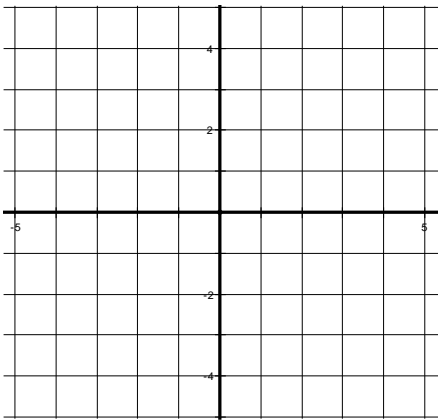


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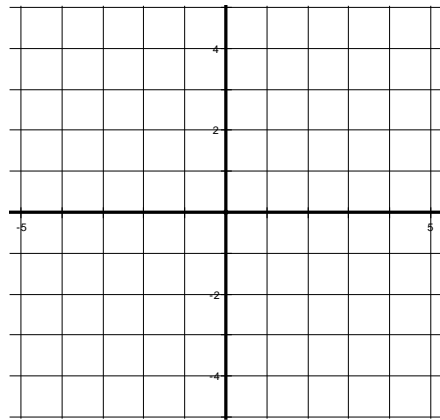
In order to be successful in the Advanced Calculus course, you will need to have a strong foundation in advanced Algebra techniques. These topics will be used through Calculus this year. This packet is due the first day of school. Please **SHOW ALL WORK** for each problem. If you do not remember a topic, look up the concept on the internet!

**1. Graph the following piecewise functions**

$$a. f(x) = \begin{cases} 2x+1 & \text{if } x < 0 \\ 2x+2 & \text{if } x \geq 0 \end{cases}$$



$$b. g(x) = \begin{cases} x^2 + 2 & \text{if } x \leq 1 \\ 2x^2 + 2 & \text{if } x > 1 \end{cases}$$

c. Evaluate  $f(0)$ d. Evaluate  $g(-2)$ **2. Factor each of the following.**

a.  $32x^3 + 12x^2 + 40x + 15$

b.  $x^3 - 8$

c.  $6x^4 - 42x^2 + 72$

d.  $b^2 + 8b$

e.  $v^2 + 9v - 10$

f.  $15x^2 + 5x - 10$

**3. Solve the following inequalities. Write your answer in interval notation.**

a.  $2 < 4 - x < 10$

b.  $|3x + 1| \geq -4$

**4. Factor each of the following. Then find its roots.**

a.  $25x^3 - 10x^2 - 20x + 8 = 0$

b.  $6x^4 - 7x^3 - 5x^2 = 0$

c.  $15x^2 + x - 2 = 0$

d.  $8x^3 - 125 = 0$

5. Find the domain of the following. Write your answer in interval notation.

a.  $f(x) = \frac{1}{\sqrt{3+2x}}$

b.  $f(x) = \frac{x+1}{x^2-1}$

c.  $f(x) = \sqrt{x-2}$

d.  $f(x) = \frac{x}{\sqrt{x+3}}$

6. Divide each of the following using synthetic.

a.  $(x^3 - x^2 - x - 2) \div (x - 3)$

b.  $(5x^4 - 2x^3 - 3x^2 + 5x + 1) \div (x - 1)$

**7. Evaluate the composite function.**

a. If  $f(x) = 5x + 8$  and  $g(x) = 4x - 1$ , find  $f(g(x))$

b. If  $f(x) = -2x + 1$  and  $g(x) = -4x^2 - 7x - 8$ , find  $f(g(5))$

**8. Simplify completely.**

a. 
$$\frac{\frac{3 - u^2}{u} - \frac{3}{u}}{\frac{3}{u}}$$

b. 
$$\frac{\frac{3 - 9}{x} - \frac{5}{3x}}$$

c. 
$$\frac{\frac{4 - x}{3} - \frac{9}{8}}{\frac{4}{3} + \frac{3}{8}}$$

d. 
$$\frac{\frac{u^2}{9}}{2u}$$

e.  $\frac{5}{2m} - \frac{6}{5m-5}$

f.  $\frac{3}{a-3} - \frac{5}{a+5}$

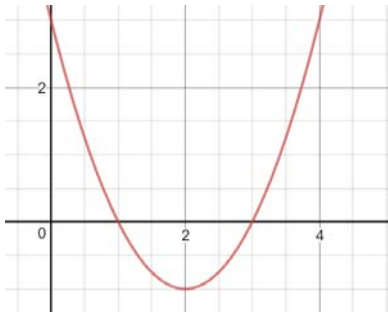
9. Given:  $f(x) = x^2 - 3x + 4$ , find the following:

a.  $f(x+2)$

b.  $f(x+2) - f(2)$

c.  $\frac{f(x+\Delta x) - f(x)}{\Delta x}$

10. The function  $f(x)$  is graphed below. For what intervals of  $x$  is  $f(x) < 0$  . Write your answer in interval notation.



11. The length of a certain rectangle is 6 meters more than twice its width. What is the perimeter of the rectangle if the area of the rectangle is 260 square meters?

12. An open box is to be made from a rectangular piece of material 9 inches by cutting equal squares from each corner and turning up the sides. Let  $x$  be the length of each side of the square cut out of each corner. Write the volume  $V$  of the box as a function of  $x$ .