

# Pre-Calculus: Preparation Problems

Answer the following questions without the aid of a calculator.

1. Given

$$f(x) = \frac{\left(\frac{x+7}{2}\right) + 5}{6 - \left(\frac{7}{x-1}\right)}$$

(a) Find  $f(4)$

(b) Find  $f\left(\frac{3}{5}\right)$

2. Simplify the following:

$$\frac{x^5}{x-11} \cdot \frac{5x^8(x-11)}{2x^4\sqrt[5]{x^3}}$$

3. Find the roots of the following polynomial and graph them on a complex plane:

$$y = x^2 + 8x + 25$$

4. Find the sum of the first 100 terms of the arithmetic series  $2+5+8\dots$

5. Find the sum of the first 10 terms of the geometric series  $1+3+9\dots$

6. Graph each of the following (assume trig functions use radians):

(a)  $y - 7 = 3(x - 2)$

(b)  $y = -2\sin(x)$

(c)  $y = \cos(2x)$

(d)  $\frac{(x-2)^2}{9} + \frac{(y-3)^2}{4} = 1$

7. Given one vector with magnitude 2 and direction  $30^\circ$  and a second vector with magnitude  $2\sqrt{3}$  and direction  $210^\circ$ , find the magnitude and direction of the resultant vector created by geometrically adding the two vectors "tip to tail."

8. Solve the following equality for  $x$ , making sure to eliminate extraneous solutions:  $4 + \sqrt{x+2} = \sqrt{x+50}$

9. Write an equation for a parabola which opens downward, has roots at 3 and 9, and whose vertex is located at (6, 18)

10. Given:

$$A = \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix} \quad B = [ 1 \quad 5 \quad 9 ]$$

Find  $|A \cdot B|$

11. If  $f(x) = \frac{3x-4}{5}$  find  $f^{-1}(x)$ .

12. If  $12 = 5^{3x}$ , solve for  $x$ . Answer in terms of a logarithm.