

**C Level Questions**

1. Simplify each polynomial expression. Write the solution in Standard Form:

a.  $(4x^3 - 10x^2 + 2x - 7) + (3 - 2x - 5x^2 - 7x^3)$

$$-3x^3 - 15x^2 - 4$$

b.  $(4x^3 - 10x^2 + 2x - 7) - (3 - 2x - 5x^2 - 7x^3)$

$$11x^3 - 5x^2 + 4x - 10$$

c.  $(2x - 7)(3x^2 - 5x + 1)$

$$\begin{array}{r} 2x \\ -7 \end{array} \begin{array}{|c|c|c|} \hline 3x^2 & -5x & 1 \\ \hline 6x^3 & -10x^2 & 2x \\ \hline -21x^2 & 35x & -7 \\ \hline \end{array} = 6x^3 - 31x^2 + 37x - 7$$

d.  $\frac{6x^3 - 29x^2 + 32x - 14}{2x - 7}$

$$\begin{array}{r} 2x \\ -7 \end{array} \begin{array}{|c|c|c|} \hline 3x^2 & -4x & 2 \\ \hline 6x^3 & -8x^2 & 4x \\ \hline -21x^2 & 28x & -14 \\ \hline \end{array} = 3x^2 - 4x + 2$$

2. Simplify each rational expression fully.

a.  $\frac{4x}{x+1} + \frac{4}{x+1}$

$$\frac{4x+4}{x+1} = \frac{4(x+1)}{x+1}$$

b.  $\frac{x^2}{x-1} - \frac{1}{x-1}$

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

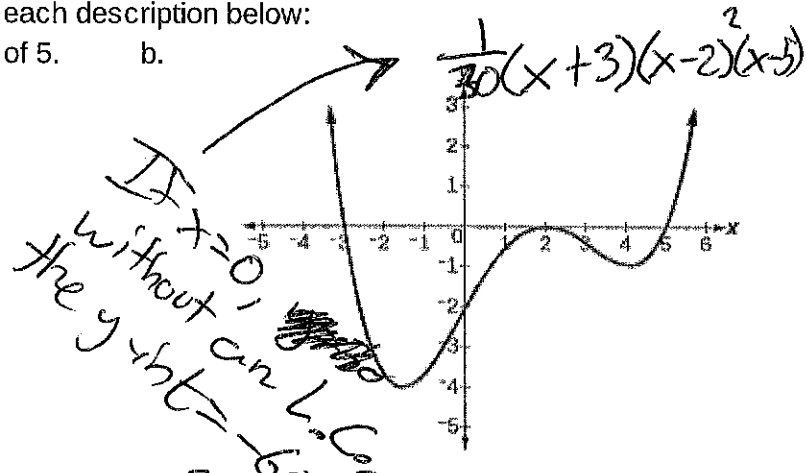
c.  $\frac{2}{2x-2} \cdot \frac{x-1}{x+3} = \frac{2(x-1)}{2(x-1)(x+3)} = \frac{1}{x+3}$

3. Write a polynomial function in Factored Form for each description below:

a. x-intercepts at (3,0), (4,0), (5,0) and a degree of 5.

$$(x-3)(x-4)(x-5)^3$$

b.



4. a. Factor  $t(x) = (x^2 + 2x + 1)(x^2 - 1)$ .

$$(x+1)(x+1)(x-1)(x+1) = (x+1)^3(x-1)$$

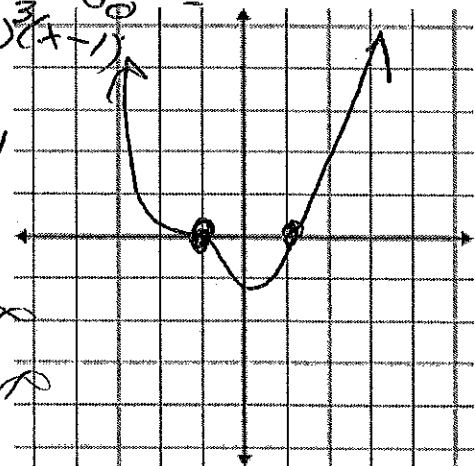
b. Identify the x-intercepts and state the multiplicity of each root.

-1 w/mult 3, 1 with mult 1

c. Use the x-intercepts and multiplicities to sketch the graph of  $t(x)$ .

d. Describe what happens to  $t(x)$  when  $x \rightarrow -\infty$  and when  $x \rightarrow \infty$ .

As  $x \rightarrow \infty, t(x) \rightarrow \infty$   
As  $x \rightarrow -\infty, t(x) \rightarrow \infty$



### A/B Level Questions

5. The polynomial  $m(x) = a(x-b)^2(x-c)$  has a leading coefficient of 10, a constant of 120 and the root with multiplicity one is 3. Find a, b, and c.

$$c=3, a=10$$

$$m(x) = 10(x-b)^2(x-3)$$

$$m(0) = 120$$

$$120 = 10(0-b)^2(0-3)$$

$$120 = 10(b)^2(-3)$$

$$120 = -30b^2$$

$$4 = b^2$$

$$b = \pm 2$$

6. Consider the function  $p(x) = -2x^6$ . Explain why  $p(x) < 0$  when  $x \rightarrow \infty$  and  $p(x) < 0$  when  $x \rightarrow -\infty$ .

Because  $x^6 > 0$  if  $x \neq 0$ .

So  $-2 \cdot x^6 < 0$  because a negative  $\cdot$  positive = neg.

7. a. Show that  $(x+1)^2 = x^2 + 2x + 1$

$$\begin{array}{r} x+1 \\ \times \\ x+1 \\ \hline x^2+1x \\ 1x+1 \\ \hline x^2+2x+1 \end{array}$$

- b. Show that  $(2x+2)^2 = 4x^2 + 8x + 4$

$$\begin{array}{r} 2x+2 \\ \times \\ 2x+2 \\ \hline 4x^2+4x \\ 4x+4 \\ \hline 4x^2+8x+4 \end{array}$$

- c. Hence, what does  $(3x+3)^2 = ?$

$$9x^2 + 6x + 9$$

- d. Hence, what does  $\frac{a^2x^2 + 2a^2x + a^2}{ax+a} = ?$

$$ax + a$$

8. Solve the equation  $\frac{2}{x+1} - \frac{1}{x-1} = 0$  for x. Check your solution(s).

$$\begin{aligned} \frac{2}{x+1} \left( \frac{x-1}{x-1} \right) - \frac{1}{x-1} \left( \frac{x+1}{x+1} \right) &= \frac{2(x-1) - (x+1)}{(x+1)(x-1)} \\ &= \frac{2x - 2 - x - 1}{(x+1)(x-1)} = \frac{x-3}{(x+1)(x-1)} = 0 \end{aligned}$$

Check:  $\frac{2}{3+1} - \frac{1}{3-1} = 0$   
 $\frac{2}{4} - \frac{1}{2} = 0$

$$\begin{aligned} x-3 &= 0 \\ x &= 3 \end{aligned}$$