MATH 30 - Precalculus, Sec. 2503

Second test. Time allowed: two hours. Professor Luis Fernández

NAME: _____

[8] **1.** Fill in the blanks to complete the statement of the Remainder Theorem:

If the polynomial $f(x)$ is divided by ....., then the remainder is .....

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[8] **2.** What is the remainder when the polynomial $p(x) = x^{100} + 2x^{11} - 1$ is divided by $(x + 1)$?

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[8] **3.** Fill in the blanks to complete the statement of the Factor Theorem:

a) If $f(c) = 0$, then ..... is a factor of $f(x)$.

b) If $(x - c)$ is a factor of $f(x)$ then .....

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[8] **4.** Find a polynomial with zeros at 9, 13 and -6. [NOTE: leave your polynomial factored; please do not expand it.]

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[8] **5.** **List** all the possible rational roots of the polynomial $25x^7 + 2x^2 - 5x + 6$. NOTE: You are only asked to list them, NOT to factor the polynomial.

[16] **6.** Divide the following polynomials using long division. Write the answer as $D = d \cdot q + r$ or as $\frac{D}{d} = q + \frac{r}{d}$ (where D is the dividend, d is the divisor, q is the quotient and r is the remainder).

a) $\dfrac{3x^3 - x^2 + 5x - 3}{x^2 + x + 1}$

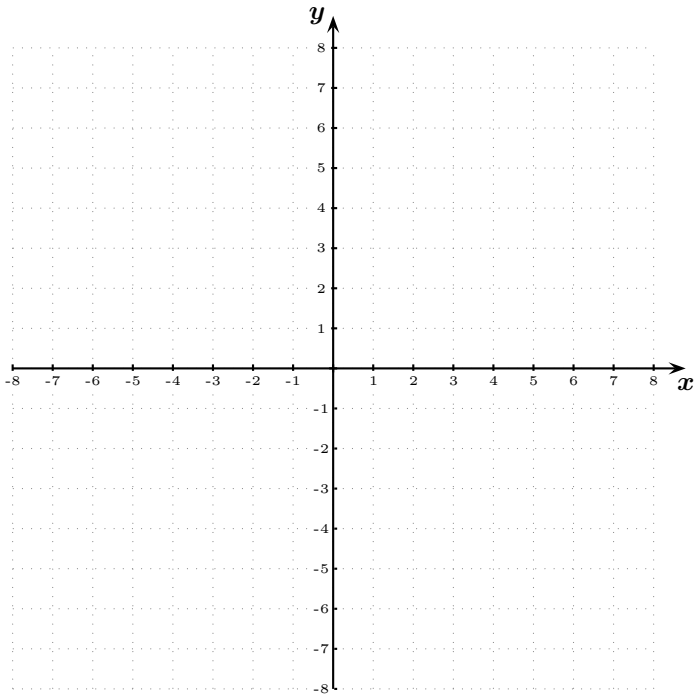
b) $\dfrac{x^5 - x^2 - 3}{x^4 + 2}$

[8] **7.** For the function $f(x) = (x-1)^2 - 4$,

a) Find the vertex and the x- and y-intercepts.

b) Write down the equation of the axis of symmetry.

c) Sketch the graph on the coordinate axes provided.



[12] **8.** Solve the equation $x^3 - 4x^2 + 3x + 2 = 0$.

[12] **9.** Factor the polynomial $f(x) = x^5 + 2x^4 - 10x^3 - 8x^2 + 33x - 18$.

[12] **10.** For the rational function $f(x) = \dfrac{x^2 + 2x - 3}{x^2 - 5x + 10}$ find

a) Its Vertical Asymptotes, if any.

b) Its Horizontal Asymptotes.

c) Its x-intercepts with multiplicity, if any.

d) Its y-intercept, if any.

[12] **11.** Sketch the graph of a rational function g that has the following properties:

a) It has a Vertical Asymptote at $x = 2$.

b) For x large, $g(x) \approx \dfrac{2x^6}{x^6} = 2$.

c) Its only x-intercepts are:
$x = -4$, with multiplicity 3;
$x = 1$, with multiplicity 2;
$x = 4$, with multiplicity 1.

d) Its y-intercept is at $y = -1$.