MATH 30 - Precalculus, Version B

First Midterm. Time allowed: 2 hours, 15 minutes.   Professor Luis Fernández

NAME: ————————————————————

[6] **1.**   Carefully write down the statement of the Remainder Theorem:

[6] **2.**   Suppose that we divide the polynomial $p(x) = x^{101} - 7x^{50} - 3x^9 - 8$ by $(x+1)$. What remainder do we get?

[10] **3.**   Divide using long division and write the answer as $D = d \cdot q + r$, where D is the dividend, d is the divisor, q is the quotient and r is the remainder.

$$\frac{6x^3 + 11x^2 - 2x - 12}{3x + 4}$$

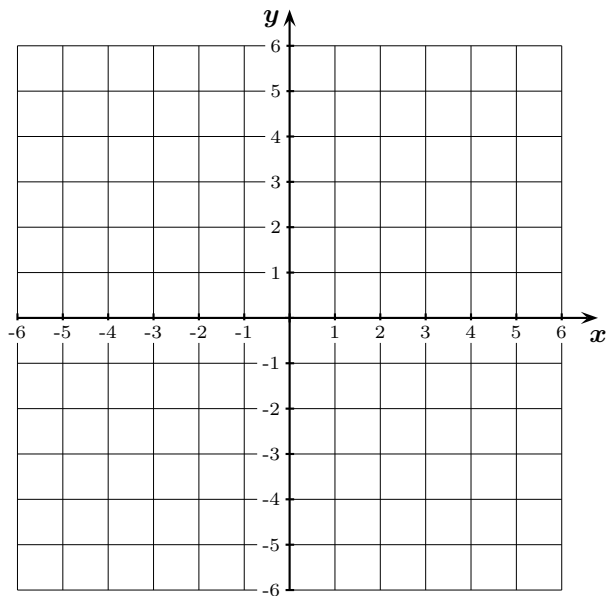[10] **4.** **List** all the possible rational roots of the polynomial $5x^6 - 14x^4 + 6x^2 - 9$.

NOTE: You are only asked to list them, NOT to factor the polynomial.

[12] **5.** Find the equation of the line perpendicular to the line $y = \dfrac{2x}{3} + 4$ and passing through the point $(1, 2)$.

[12] **6.** Consider the line given by the equation $2x + 3y = 6$.

a) Find its slope and y-intercept.

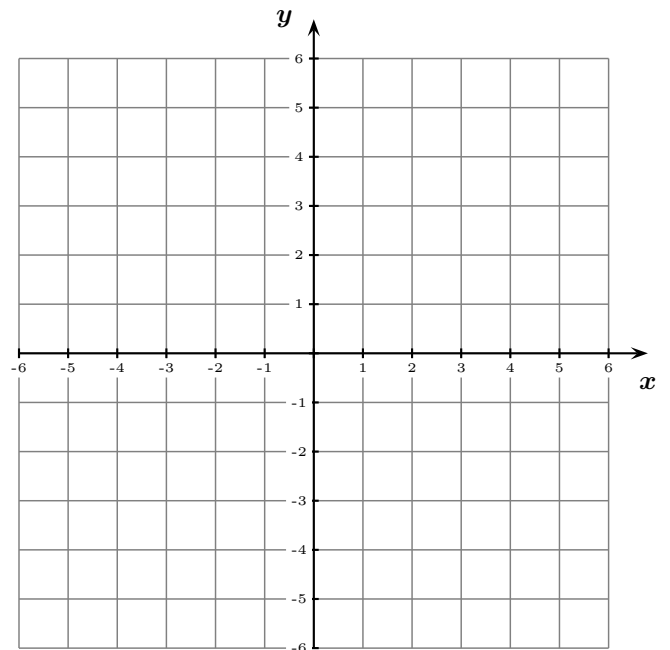**b)** Graph the line in the coordinate axes below.

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[12] **7.** For the quadratic function $f(x) = -2(x-1)^2 + 2$,

   a) Find the vertex.

   b) Find the x-intercepts, if any.

   c) Find the y-intercepts.

   d) Determine whether the parabola opens up or down. Sketch the graph on the coordinate axes provided.

[12] **8.** Find all the solutions of the equation $x^3 - 5x^2 + 5x - 1 = 0$.

[NOTE: one of the solutions is rational, so it can be found using synthetic division. The other two are irrational; to find them you need to use the quadratic formula or complete the square.]

[12] **9.**   Factor completely the polynomial $f(x) = x^4 + 4x^3 - 6x^2 - 4x + 5$.

[12] **10.** The polynomial $f(x) = x^3 - 3x - 2$ can be factored as $f(x) = (x+1)^2(x-2)$.

a) Find the end behavior of f.

b) Find the x-intercepts of f and their multiplicity, and the local behavior at the intercepts.

c) Find the y-intercept of f.

d) Sketch the graph of f in the axes provided.

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