MATH 30 - Precalculus, Version B

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

NAME: _____

[10] **1.**

    a) Fill in the blanks to complete the statement of the Remainder Theorem:

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

    b) What is the remainder when the polynomial $p(x) = x^{101} - 7x^{50} - 3x^9 - 8$ is divided by $(x + 1)$?

[10] **2.**

    a) Fill in the blanks to complete the statement of the Factor Theorem:

        • If ...., then .... is a factor of $f(x)$.

        • If .... is a factor of $f(x)$, then ....

    b) Find a polynomial **of degree 4** with zeros at -2, 3, and -5.
        [NOTE: leave your polynomial factored; please do not expand it.]

[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.**

    a) Find the slope and equation of the line passing through the points $(1, 2)$ and $(3, -3)$,

    b) 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.
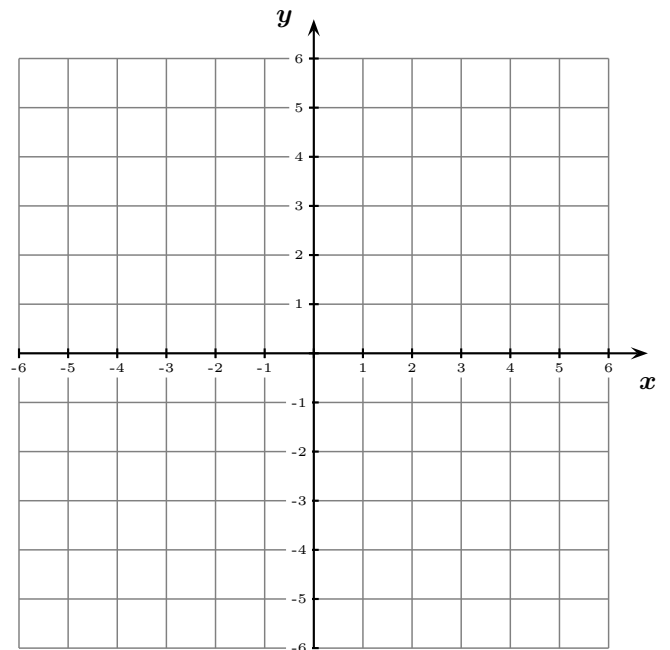
    b) Graph the line in the coordinate axes below.
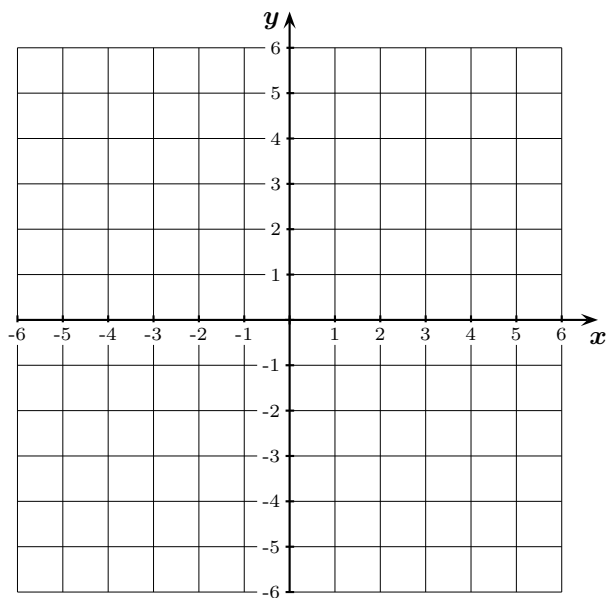
[12] **7.** For the quadratic function $f(x) = -2(x-1)^2 + 2$,

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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