

MATH 30 - Precalculus, Version A

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 $p(x) = x^{100} + 5x^{50} - 6x^{23} + 5$ 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 -4 , 5 , and -6 .

[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.

$$\frac{6x^3 - 6x^2 - 24x - 11}{2x + 2}$$

- [10] **4.** **List** all the possible rational roots of the polynomial $3x^6 - 3x^2 - 15x + 4$.
NOTE: You are only asked to list them, NOT to factor the polynomial.

[12] **5.**

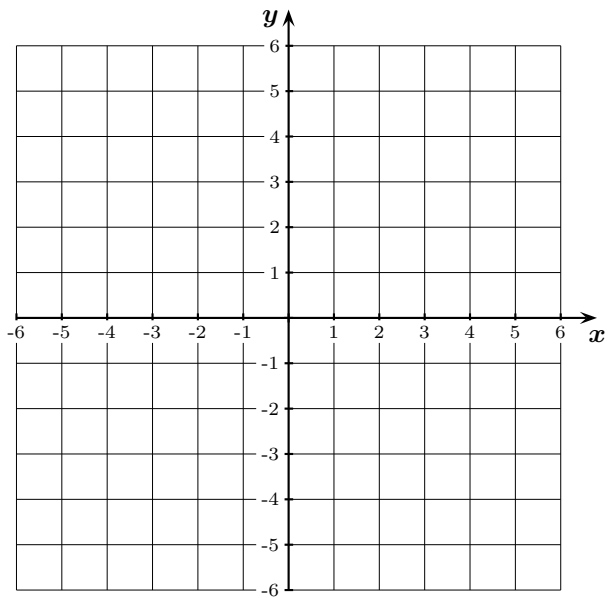
a) Find the slope and equation of the line passing through the points $(1, 2)$ and $(3, -3)$,

b) Find the equation of the line perpendicular to the line $y = \frac{2x}{3} + 4$ 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.



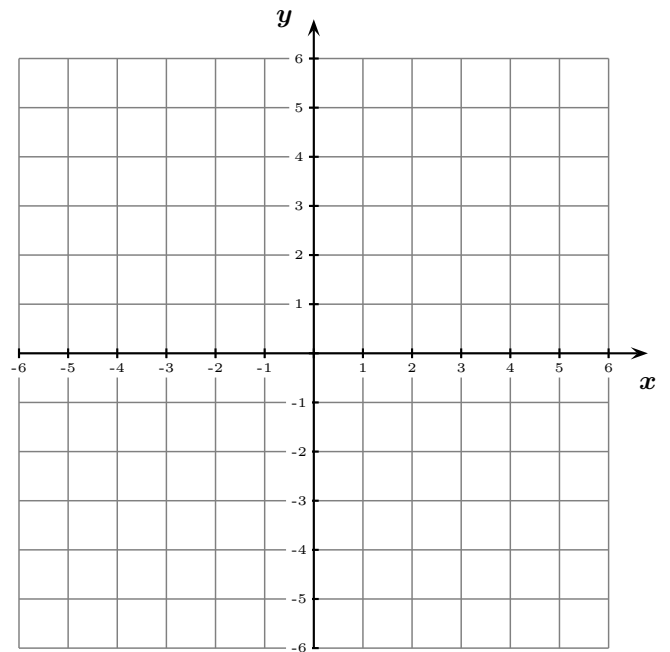
[12] 7. For the quadratic function $f(x) = -2(x - 2)^2 + 2$,

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 $x^3 - 5x^2 + 6x - 2 = 0$.

[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 $f(x) = x^4 + 2x^3 - 4x^2 - 2x + 3$.

[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.

