MATH 30 - Precalculus. Homework 4. Due Tu. 03/14/2019. Professor Luis Fernández

NAME:_____

Write your answers in other sheets and **STAPLE this one to your other sheets.**

1. For each of the following functions, find

(i) The end behaviour of the graph.

(ii) The y-intercept.

(iii) For exercises **a)**, **b)**, **c)**, the x-intercepts with their multiplicity and the local behaviour at the x-intercepts.

(iv) Do a sketch of the graph, in the graph paper provided, of each function in **a)**, **b)**, **c)**.

(v) Do the graphs of all the functions using any graphing device; for example, go to:

http://www.mathsisfun.com/data/function-grapher.php

Compare **a)**, **b)**, **c)**, with your sketches. Also check that the end behaviour of the graphs that you found in part **(i)** are all correct.

a) $f(x) = 2(x-2)^2(x+1)$ **b)** $f(x) = -2x^2(x-2)(x+2)^2$ **c)** $f(x) = 3x(x+1)^2(x-1)^3$

d) $f(x) = -x^4 + 5x^2 + x$ **e)** $f(x) = 2x^4 + 3x^2 - 3$ **f)** $f(x) = -3x^3 + 3x^2 - x + 1$

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2. Divide using long division. State the quotient $q(x)$ and the remainder $r(x)$. Then write the solution in two different ways:

1. As $D(x) = d(x)q(x) + r(x)$.
2. As $\dfrac{D(x)}{d(x)} = q(x) + \dfrac{r(x)}{d(x)}$.

[Where $D(x)$ is the dividend (the polynomial that is being divided; in other words, the numerator) and $d(x)$ is the divisor (the polynomial that divides; in other words, the denominator).]

a) $\dfrac{x^3 - 2x^2 - 5x + 6}{x + 2}$

b) $\dfrac{3x^4 - 2x^3 - 7x^2 + x - 2}{x^2 - 2x + 3}$

c) $\dfrac{x^5 + x^4 - x^3 - x^2 + 3x - 1}{x^2 + x + 1}$

d) $\dfrac{x^4 - 2x^2 - 5x + 6}{x - 3}$

e) $\dfrac{3x^6 - 2x^3 - 7x^2 - 2}{x^2 - x + 2}$

f) $\dfrac{x^7 - 1}{x - 1}$

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3. Divide using synthetic division. State the quotient $q(x)$ and the remainder $r(x)$. Then write the solution in two different ways:

1. As $D(x) = d(x)q(x) + r(x)$.
2. As $\dfrac{D(x)}{d(x)} = q(x) + \dfrac{r(x)}{d(x)}$.

[Where $D(x)$ is the dividend (the polynomial that is being divided; in other words, the numerator) and $d(x)$ is the divisor (the polynomial that divides; in other words, the denominator).]

a) $\dfrac{x^3 - 2x^2 - 5x + 6}{x - 3}$

b) $\dfrac{-2x^3 - 7x^2 + x - 2}{x + 1}$

c) $\dfrac{x^4 - x^3 + x - 1}{x - 2}$

d) $\dfrac{x^7 - 1}{x - 1}$

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4. Use synthetic division and the remainder theorem to find the indicated function value.

a) $f(x) = x^3 - 4x^2 + x + 2$; find $f(3)$.

b) $f(x) = -2x^4 - x^2 + x - 2$; find $f(-1)$.

c) $f(x) = x^5 - 4x^2 + 1$; find $f(2)$.

d) $f(x) = -x^4 - 5x^3 - x^2 + 3x + 2$; find $f\left(\frac{1}{2}\right)$.

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5. Solve the equation $2x^3 - 3x^2 - 11x + 6 = 0$ given that -2 is a zero of $f(x) = 2x^3 - 3x^2 - 11x + 6$.

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6. Solve the equation $3x^3 + 7x^2 - 22x - 8 = 0$ given that $-\frac{1}{3}$ is a root.

7. The remainder from dividing a polynomial $p(x)$ by $(x+4)$ is 3. How much is $p(-4)$? Which theorem are you using?

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8. The remainder from dividing a polynomial $p(x)$ by $\left(x - \frac{1}{2}\right)$ is $\frac{11}{17}$. How much is $p\left(\frac{1}{2}\right)$? Which theorem are you using?

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9. What is the remainder you would get it you divide the polynomial $f(x) = x^{103} + x^{50} + 2$ by $(x-1)$?
NOTE: you do not really have to divide this huge polynomial; you can do this in your head if you use the appropriate theorem!