HW #3

Kerry Ojakian's MTH 30 Class
Due Date: Tuesday November 25 (at the beginning of class)

General Instructions:

- Homework must be stapled, be relatively neat, and have your name on it. All work and answers should be on this sheet.
- Use tutors, work with other students, but ... don't copy!

The Assignment

1. Determine the end behavior of the functions.

   (a) $g(x) = -90x^2$ (b) $f(x) = 5x^3$

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2. Determine the end behavior of the function $f(x) = 3x^3 + 7x^4 - 17x$.

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3. Suppose a polynomial function has exactly 5 intercepts. What is the least possible degree of the function?

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4. Show that the polynomial function $f(x) = x^3 - 9x$ has a zero between $x = -4$ and $x = -2$.

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5. Graph $g(x) = 2(x-5)^3(x+1)^2$. Find its zeroes and the multiplicity of each.

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6. Graph a polynomial function of degree 5 with a root of multiplicity 2 at -3, a root of multiplicity 2 at 2, and a final root at -2. It has a y-intercept at $(0, -3)$.

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7. What is the remainder you would get it you divide the polynomial $f(x) = x^{103} + x^{50} + 2$ by $(x-1)$?

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8. Is $(x+1)$ a factor of $x^5 - 2x^4 - x + 2$?

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9. Find the possible rational zeros of the polynomial $6x^4 + 3x^2 + 4x - 15$

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10. Divide $\dfrac{3x^6 - 2x^3 - 7x^2 - 2}{x^2 - x + 2}$ using long division. Write your answer in the form $\dfrac{N(x)}{d(x)} = q(x) + \dfrac{r(x)}{d(x)}$, where N is the divident, d is the divisor, q is the quotient, and r is the remainder.

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11. 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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12. Solve. $x^3 - 4x^2 - 7x + 10 = 0$. Then use that result to easily factor $x^3 - 4x^2 - 7x + 10$.

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13. Graph the function, find its asymptotes, and find its domain and range:

$$g(x) = 2 + \frac{1}{(x-3)^5}$$

Also, describe its end behavior, and use arrow notation to describe the behavior at the undefined value.

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14. Sketch $f(x) = 10^x$ and $g(x) = \log_{10}(x)$ on the same axes (you may scale the y-axis).
What are the asymptotes of each graph?
Find any two points that are symmetric across the line $y = x$.

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15. For the function $f(x) = \dfrac{3x^2}{x^2 - 9}$, do the following:

(a) Determine the end behaviour and find horizontal asymptotes.

(b) Find the y-intercept.

(c) Find the x-intercepts with their multiplicity.

(d) Find the vertical asymptotes.

(e) Make a sketch of the graph.

16. Let $f(x) = \dfrac{(2x^2 + x)(x - 3)}{(x + 5)(x^2 + x - 2)}$

(a) Evaluate $f(3)$, $f(0)$, and $f(-1)$.

(b) Determine the values of x for which the function is undefined.

(c) Determine the values of x for which the function is defined.

(d) What is the domain of the function?

(e) For which inputs to the function is the output 0?

(f) Find the values of x such that $f(x) = 0$.

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17. Evaluate the following expressions:

(a) $\log_2(16)$

(b) $\log_2\left(\frac{1}{16}\right)$

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18. Use the properties of logarithms to expand the following expressions.

(a) $\log_b(3x^2y^3)$

(b) $\log_8 \dfrac{x^{\frac{1}{2}}}{y^3}$

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19. Use the properties of logarithms to condense the following expressions.

(a) $\log x + \log 5 =$

(b) $\log_8 x + 3\log_8 y =$

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20. Solve each.

(a) $\log_5(x-2) = \log_5 3$

(b) $(\log_5 x) - 2 = \log_5 3$

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21. Solve. $8^{1-x} = 4^{x+2}$

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22. Solve (expressing your answer using logarithms). $7^{2x-1} = 3^{x+2}$
