Algebra 2 Honors **Name**_____
WS: 3.1 – 3.4 Review **Date**_____**Block**_____

Part I: Applications

1. A biologist has found that the number of branches on a certain rare tree in its first few years of life can be modeled by the polynomial $\boldsymbol{B(y) = 4y^2 + y}$. The number of leaves on each branch can be modeled by the polynomial $\boldsymbol{L(y) = 2y^3 + 3y^2 + y}$, where y is the number of years after the tree reaches a height of 6 feet. Write a polynomial describing the total number of leaves on the tree.
2. The total number of dollars donated each year to a small charitable organization has followed the trend $\boldsymbol{d(t) = 2t^3 + 10t^2 + 2000t + 10{,}000}$, where d is dollars and t is the number of years since 1990. The total number of donors each year has followed the trend $\boldsymbol{p(t) = t^2 + 1000}$. Write an expression describing the average number of dollars per donor.
3. The voltage generated by an electrical circuit changes over time according to the polynomial $\boldsymbol{V(t) = t^3 - 4t^2 - 25t + 100}$, where V is in volts and t is in seconds. Factor the polynomial to find the times when the voltage is equal to zero.

Part II: Extra Practice

4. What polynomial could you add to $3x^4 - 9x^3 + 5x^2 - x + 7$ to get a sum of $3 + 4x^4 + 3x - x^3 + 3x^2$?
5. What polynomial could you subtract from $5x^3 - 12x - x^2 + 9 - 12x^5 - 6x^4$ to give a difference of $19 + 8x^3 - 18x - 19x^5 - 2x^2 - 8x^4$?

In 6 - 7, simplify.

6. $\left(\frac{1}{3}x + 4\right)^3$

7. $(4x - 5)(2x^5 + x^3 - 1)$

In 8 - 9, divide by using long division.

8. $(x^3 + 12x^2 - 4) \div (x - 3)$

9. $(12x^4 + 23x^3 - 9x^2 + 15x + 4) \div (3x - 1)$

In 10 - 11, divide by using synthetic division. Check the leading coefficient of your divisor!

10. $(25x^3 + 30x + 40) \div (5x + 10)$

11. $\left(x^4 - \frac{1}{16}\right) \div (2x - 1)$

In 12 - 13, use synthetic substitution to evaluate the polynomial for the given value.

12. $P(x) = 4x^2 - 9x + 2$ for $x = 3$

13. $P(x) = -3x^4 + 5x^3 - x + 7$ for $x = -2$

In 14 - 17, use the Factor Theorem to verify that each linear binomial is a factor of the given polynomial. Then use synthetic division to write the polynomial as a product.

14. $(x + 5)$; $P(x) = 2x^2 + 6x - 20$

15. $(x - 1)$; $P(x) = x^4 - 6x^3 + 4x^2 + 1$

16. $(x + 2)$; $P(x) = 3x^3 + 12x^2 + 17x + 10$

17. $(x - 8)$; $P(x) = x^4 - 8x^3 - 4x^2 + 33x - 8$

In 18 - 23, factor each expression.

18. $16x^3 - 12x^2 + 20x - 15$

19. $3x^6 + 54x^4 + 243x^2$

20. $x^6 - 10x^5 + 25x^4$

21. $6x^3 + 12x^2 + 4x + 8$

22. $250x^4 + 54x$

23. $-3x^5 + 24x^2$