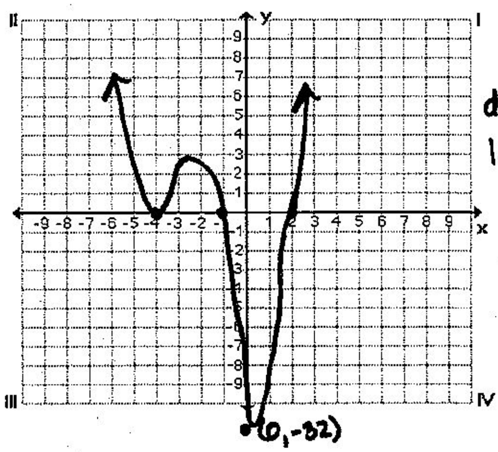
Pre-Calculus **Quiz 3.1-3.4 Review #2** Name: Key

***The answer key for this review will be posted online. Please use class time to complete this review for Friday.*

Identify the zeros and their multiplicities (greater than one), and the y-intercept of the function. Then use end behavior and multiplicities to sketch a graph of the function. NO CALCULATOR!!!

1. $P(x) = (x+1)(x+4)^2(x-2)$



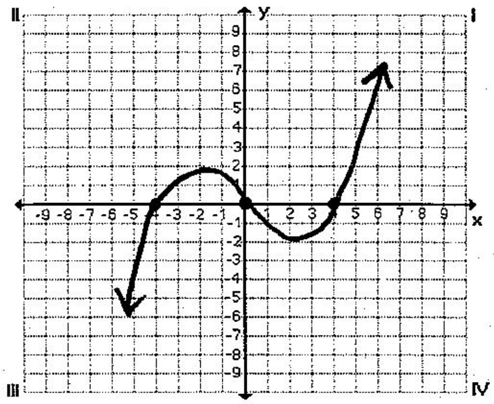
degree = 4, even
lead. coeff. = +

Zeros: -1 mult 1; -4 mult. 2; 2 mult. 1

Y-Intercept: $(0, -32)$

2. $P(x) = x^3 - 16x$

$x(x^2-16) \rightarrow x(x+4)(x-4)$



degree = odd, 3
lead. coeff = +

Zeros: 0, 4, -4 all mult 1

Y-Intercept: $(0,0)$

Determine the end behavior of the polynomial function. NO CALCULATOR!!!

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

Down to the right
Up to the left

4. $P(x) = x^4 - 5x^3 + 9x^2 + 6x - 8$

Up to the right
Up to the left

Divide the polynomials using long division.

5. $(x^3 - x^2 + 11x + 2) \div (x-4)$

$$\begin{array}{r} x^2+3x+23 \\ x-4\overline{)\,x^3-x^2+11x+2} \\ -(x^3-4x^2) \\ 3x^2+11x \\ -(3x^2-12x) \\ 23x+2 \\ 23x-92 \end{array}$$

R. 94

$\boxed{x^2+3x+23+\frac{94}{x-4}}$

6. $\frac{x^3+2x^2-10}{x+3}$

$$\begin{array}{r} x^2-1x+3 \\ x+3\overline{)\,x^3+2x^2+0x-10} \\ -(x^3+3x^2) \\ -x^2+0x \\ -(-x^2-3x) \\ 3x-10 \\ -(3x+9) \\ -19 \end{array}$$

$x^2-x+3\ \frac{-19}{x+3}$

Divide the polynomials from #5 and #6 using synthetic division.

7. $(x^3 - x^2 + 11x + 2) \div (x-4)$

$$\begin{array}{c|cccc} 4 & 1 & -1 & 11 & 2 \\ & & 4 & 12 & 92 \\ \hline & 1 & 3 & 23 & 94 \end{array}$$

$\boxed{x^2+3x+23+\frac{94}{x-4}}$

8. $\frac{x^3+2x^2-10}{x+3}$

$$\begin{array}{c|cccc} -3 & 1 & 2 & 0 & -10 \\ & & -3 & 3 & -9 \\ \hline & 1 & -1 & 3 & -19 \end{array}$$

$\boxed{x^2-x+3\ \frac{-19}{x+3}}$

Use the <u>Remainder Theorem</u> to evaluate P(c).

9. $P(x) = 2x^3 - 9x^2 - 7x + 13$; c = 5 $\boxed{3}$

$P(5) = 2(5)^3 - 9(5)^2 - 7(5) + 13$
$2(125) - 9(25) - 7(5) + 13$
$250 - 225 - 35 + 13 = \boxed{3}$

10. $P(x) = x^4 + 4x^3 + 7x^2 + 10x + 15$; c = -3 $\boxed{21}$

$P(-3) = (-3)^4 + 4(-3)^3 + 7(-3)^2 + 10(-3) + 15$
$81 + 4(-27) + 7(9) + 10(-3) + 15$
$81 - 108 + 63 - 30 + 15 = \boxed{21}$

11. Find the remainder when $x^{301} - 6x^{201} - x^2 - 2x + 4$ is divided by $x + 1$.

$(-1)^{301} - 6(-1)^{201} - 2(-1) + 4 = -1 - 6(-1) - 2(-1) + 4 = -1 + 6 + 2 + 4 = \boxed{11}$

Use the Factor Theorem to show that $x + 4$ is a factor of P(x).

12. $P(x) = x^5 + 4x^4 - 7x^3 - 23x^2 + 23x + 12$

$P(-4) = (-4)^5 + 4(-4)^4 - 7(-4)^3 - 23(-4)^2 + 23(-4) + 12$

$-1024 + 1024 - 7(-64) - 23(16) - 92 + 12 = -1024 + 1024 + 448 - 368 - 92 + 12 = \boxed{0}$

Find a polynomial of the specified degree that has the given zeros (and other characteristics)

13. **Degree** 3; **Zeros** 2, 3, and – ½; **Constant** is 12.

$\underbrace{(x-2)(x-3)}(2x+1)$

$(x^2 - 5x + 6)(2x+1) = 2x^3 + x^2 - 10x^2 - 5x + 12x + 6 = 2x^3 - 9x^2 + 7x + 6 \rightarrow \boxed{4x^3 - 18x^2 + 14x + 12}$

TO GET A CONSTANT OF 12, MULTIPLY THE EQUATION ABOVE BY 2.

Use the given polynomial to fill in the missing information.

14. $P(x) = x^4 - 2x^3 - 7x^2 + 8x + 12$

a) **List** all possible rational zeros: $\boxed{\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12}$

b) **Find** all real zeros: $\boxed{-1, 2, 3, -2}$

1 −2 −7 8 12 / 1 −1 −8 0 / 1 −1 −8 0

−1 | 1 −2 −7 8 12 / −1 3 4 −12 / 1 −3 −4 12 0

−1 | 1 −3 −4 12 0 / −1 4 0 / 1 −4 0 12

2 | 1 −3 −4 12 / 2 −2 −12 / 1 −1 −6 0

$x^2 - x - 6 \rightarrow (x-3)(x+2)$

3, −2

Evaluate the expression and write it in the form $a + bi$.

15. $(5 - 7i) - (12 + 2i)$

$5 - 7i - 12 - 2i =$

$\boxed{-7 - 9i}$

16. $(2 - 3i)(1 + 4i)$

$2 + 8i - 3i - 12i^2$

$2 + 5i + 12 = \boxed{14 + 5i}$

17. $6i\left(4 - \frac{2}{3}i\right)$

$24i - 4i^2$

$\boxed{4 + 24i}$

18. $\frac{4-3i}{4+3i} \cdot \frac{4-3i}{4-3i} = \frac{16 - 24i + 9i^2}{16 - 9i^2} = \frac{7 - 24i}{25}$

$= \boxed{\frac{7}{25} - \frac{24}{25}i}$

19. i^{121}

$\frac{121}{4} = 30 \boxed{R\ 1} \rightarrow \boxed{i^1}$

20. $\sqrt{-10} \cdot \sqrt{-40}$

$\sqrt{-1} \cdot \sqrt{10} \cdot \sqrt{-1} \cdot \sqrt{40}$

$i^2 \sqrt{400}$

$-1(20) = \boxed{-20}$

21. $(3 - \sqrt{-12})(2 + \sqrt{-27})$

$(3 - 2i\sqrt{3})(2 + 3i\sqrt{3}) = 6 + 9i\sqrt{3} - 4i\sqrt{3} - 18i^2$

$6 + 5i\sqrt{3} + 18 = \boxed{24 + 5i\sqrt{3}}$

Solve the equation. Quadratic Formula!

22. $x^2 - 4x + 5 = 0$

$\frac{4 \pm \sqrt{(-4)^2 - 4(1)(5)}}{2(1)} = \frac{4 \pm \sqrt{16 - 20}}{2} = \frac{4 \pm \sqrt{-4}}{2} =$

$\frac{4 \pm 2i}{2} = \boxed{2 \pm i}$

23. $x^2 + x + 1 = 0$

$\frac{-1 \pm \sqrt{(1)^2 - 4(1)(1)}}{2(1)} = \frac{-1 \pm \sqrt{1 - 4}}{2} = \frac{-1 \pm \sqrt{-3}}{2} =$

$\boxed{\frac{-1 \pm i\sqrt{3}}{2} = -\frac{1}{2} \pm \frac{\sqrt{3}}{2}i}$