CP Algebra 3
Chapter 3 Test Review

Name Key

**Add or subtract. Write your answer in standard form.**

1. $(8x^3-4x^2-3x+1)-(1-5x^2+x)$

$8x^3+1x^2-4x$

2. $(6x^2+7x-2)+(1-5x^3+3x)$

$-5x^3+6x^2+10x-1$

**Find each product.**

3. $5x^2(3x-2)$

$15x^3-10x^2$

4. $(x-2)(x^2-2x-3)$

$x^3-4x^2+x+6$

5. $ab^2(a^2-a+ab)$

$a^3b^2-a^2b^2+a^2b^3$

6. $(2x+5)(x^3-x^2+1)$

$2x^4+3x^3-5x^2+2x+5$

7. $(x-3)^3$

$x^3-9x^2+27x-27$

8. $(2x+1)^4$

$16x^4+32x^3+24x^2+8x+1$

**Divide using long division.**

9. $(x^3-5x^2+2x-7)\div(x+2)$

$x^2-7x+16+\frac{-39}{x+2}$

10. $(8x^4+6x^2-2x+4)\div(2x-1)$

$4x^3+2x^2+4x+1+\frac{5}{2x-1}$

**Divide using synthetic division.**

11. $(x^3-4x^2+3x+2)\div(x-3)$ $= x^2-x+\frac{2}{x-3}$

| 3 | 1 | -4 | 3 | 2 |
|---|---|---|---|---|
| | | 3 | -3 | 0 |
| | 1 | -1 | 0 | 2 |

12. $(x^3+2x-1)\div(x-2)$ $= x^2+2x+4+\frac{7}{x-2}$

| 2 | 1 | 0 | 2 | -1 |
|---|---|---|---|---|
| | | 2 | 4 | 8 |
| | 1 | 2 | 4 | 7 |

**Determine whether the given binomial is a factor of the polynomial, P(x).**

13. $(x+3); P(x)=x^3+2x^2-5$

| -3 | 1 | 2 | 0 | -5 |
|---|---|---|---|---|
| | | -3 | 3 | -9 |
| | 1 | -1 | 3 | -14 |

Not a factor

14. $(x-1); P(x)=4x^4-5x^2+3x-2$

| 1 | 4 | 0 | -5 | 3 | -2 |
|---|---|---|---|---|---|
| | | 4 | 4 | -1 | 2 |
| | 4 | 4 | -1 | 2 | 0 |

Remainder is zero so yes, is a factor

15. Use synthetic Substitution to evaluate polynomial $f(x) = 3x^4 - x^3 + 2x - 1$ for $x = -2$

| -2 | 3 | -1 | 0 | 2 | -1 |
|---|---|---|---|---|---|
| | | -6 | 14 | -28 | 52 |
| | 3 | -7 | 14 | -26 | 51 |

$f(-2) = 51$

**Factor each expression.**

16. $x^3-x^2-16x+16$

$x^2(x-1)-16(x-1)$

$(x^2-16)(x-1)$

$(x+4)(x-4)(x-1)$

17. $4x^3-8x^2-x+2$

$4x^2(x-2)-1(x-2)$

$(4x^2-1)(x-2)$

$(2x-1)(2x+1)(x-2)$

18. $81-3x^3$

$-3(-27+x^3) = -3(x^3-27)$

$-3(x-3)(x^2+3x+9)$

**Solve by factoring OR using the reverse binomial method.**

19. $16x^2 - 1 = 0$

$16x^2 = 1$

$x^2 = \frac{1}{16}$ $\quad x = \pm\frac{1}{4}$

20. $3x^3 + 3x^2 - 60x = 0$

$3x(x^2 + x - 20) = 0$

$3x(x+5)(x-4) = 0$

$x = 0, 4, -5$

21. $3x^3 - 26x^2 - 9x = 0$

$x(3x^2 - 26x - 9) = 0$

$x(3x+1)(x-9) = 0$

$x = 0, -\frac{1}{3}, 9$

22. $16x^4 + 32x^3 + 24x^2 + 8x + 1 = 0$

Reverse Binomial $(2x+1)^4 = 0$

$2x + 1 = 0$ $\quad x = -\frac{1}{2}$

23. $x^3 - 9x^2 + 27x - 27 = 0$

$(x-3)^3 = 0$

$x - 3 = 0$ $\quad x = 3$

**Identify all of the real roots of each equation.**

24. $x^3 - 5x^2 + 8x - 4 = 0$

$x = 1, 2$ mult. of 2

25. $x^3 + 6x^2 + 9x + 2 = 0$ $\quad x = -2$ is the only real root

26. $x^3 + 3x^2 + 3x + 1 = 0$

$x = -1$ mult. of 3

27. $x^4 - 12x^2 + 27 = 0$

$x = \pm 3, \pm\sqrt{3}$

**Write the simplest polynomial function with the given roots.**

28. $-\frac{1}{2}, -2, 3$

$x^3 - \frac{1}{2}x^2 - \frac{13}{2}x - 3$

or

$2x^3 - 1x^2 - 13x - 6$

29. $-\sqrt{2}, -1$

$x^3 + x^2 - 2x - 2$

30. $2, 1-i$

$x^3 - 4x^2 + 5x - 2$

**Solve the equation by finding all roots.**

31. $x^3 - x^2 + 4x - 4 = 0$

$x^2(x-1) + 4(x-1) = 0$

$(x^2+4)(x-1) = 0$

$x = 1, \pm 2i$

32. $x^4 - x^2 - 2 = 0$

$x = \pm\sqrt{2}, \pm i$

**Without a Calculator**

**Identify the leading coefficient, degree, and end behavior.**

33. $-2x^3 + 5x^2 + 3$

LC: $-2$

D: 3

EB: $x \to \infty$ $f(x) \to -\infty$

$x \to -\infty$ $f(x) \to \infty$

34. $x^4 + 2x^3 - 3x + 1$

LC: $-2$

D: 3

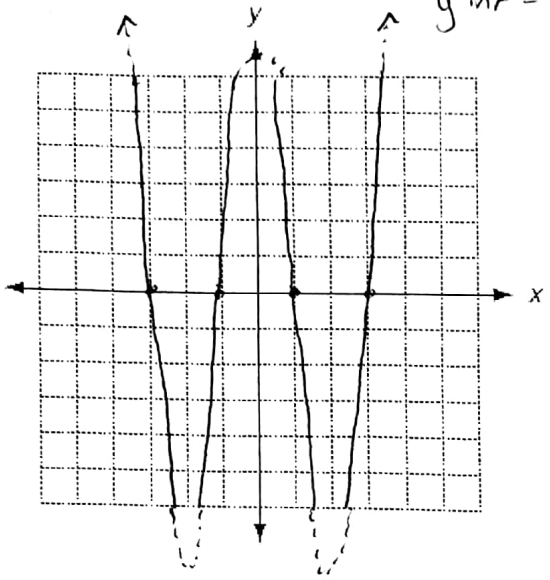
EB: $x \to \infty$ $f(x) \to \infty$

$x \to -\infty$ $f(x) \to \infty$

**Graph each function.**

35. $f(x) = x^4 - 10x^2 + 9$

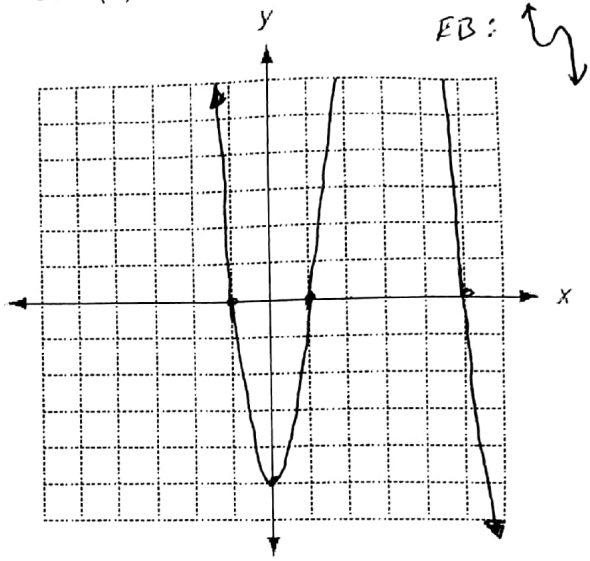
x int = ±1, ±3
y int = (0, 9)




$f(3) = -27 + 45 + 3 - 5 = 16$

y int = (0, -5)
x int = ±1, 5
EB:

36. $f(x) = -x^3 + 5x^2 + x - 5$




**Write a function that transforms $f(x) = x^4 - 6x^2 - 4$ in each of the following ways. Support your solution by using the graphing calculator.**

37. Stretch vertically by a factor of 2, and move 9 units up.

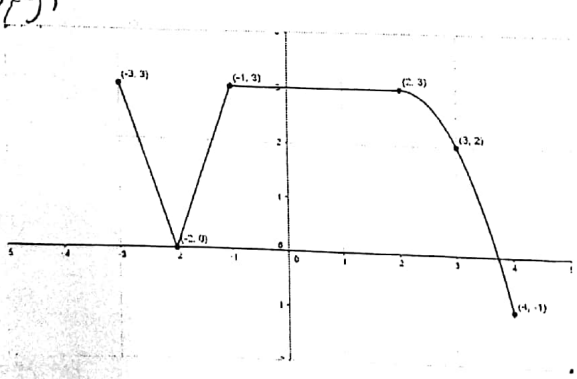
$g(x) = 2f(x) + 9$ $g(x) = 2(x^4 - 6x^2 - 4) + 9$ $g(x) = 2x^4 - 12x^2 + 1$

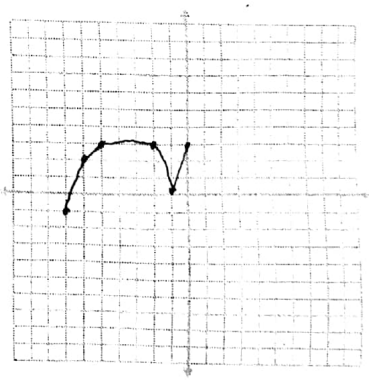
38. Move 3 units right, and reflect across the x-axis.

$g(x) = -1 \cdot f(x-3)$ $g(x) = -1((x-3)^4 - 6(x-3)^2 - 4)$

39. Given the graph below, translate it by moving right 3 and reflecting over the y axis.

$(x, y) \rightarrow (-1(x+3), y)$
$(-3, 3) \rightarrow (0, 3)$
$(-2, 0) \rightarrow (-1, 0)$
$(-1, 3) \rightarrow (-2, 3)$
$(2, 3) \rightarrow (-5, 3)$
$(3, 2) \rightarrow (-6, 2)$
$(4, -1) \rightarrow (-7, -1)$



**Polynomial Regression - Review notes and worksheet from class.**