Algebra 2

Name Key

# CH 3 End review

Date _____ Period ____

**Divide with long division.**

1) $(k^3 + 4k^2 - 14k - 5) \div (k - 2)$

$k^2 + 6k - 2$

$k-2 \overline{)\, k^3 + 4k^2 - 14k - 5}$

$k^3 - 2k^2$

$0 + 6k^2 - 14k$

$6k^2 - 12k$

$0 \quad -2k - 5$

$-2k + 4$

$0 \quad -9$

$k^2 + 6k - 2 - \frac{9}{k-2}$

2) $\frac{p^3 - 5p^2 + 7p - 3}{p^2 - 4}$

$p - 5$

$p^2 - 4 \overline{)\, p^3 - 5p^2 + 7p - 3}$

$p^3 + 0p^2 - 4p$

$0 - 5p^2 + 11p - 3$

$-5p^2 + 0p + 20$

$0 \quad 11p - 23$

$p^2 - 4 + \frac{11p - 23}{p^2 - 4}$

**Divide.**

3) $(b^3 + 4b^2 - 9) \div (b + 4)$

$-4$ | $1 \quad 4 \quad 0 \quad -9$

$+ \downarrow \quad -4 \quad 0 \quad 0$

$1 \quad 0 \quad 0 \quad -9$

$b^2 - \frac{9}{b+4}$

4) $(n^4 - 55n^2 + 36n + 49) \div (n - 7)$

$7$ | $1 \quad 0 \quad -55 \quad 36 \quad 49$

$+ \downarrow \quad 7 \quad 49 \quad -42 \quad -49$

$1 \quad 7 \quad -6 \quad -7 \quad 0$

$n^3 + 7n^2 - 6n - 7$

5) $(v^3 - 9v^2 + 13v + 25) \div (v - 6)$

$6$ | $1 \quad -9 \quad 13 \quad 25$

$+ \downarrow \quad 6 \quad -18 \quad -30$

$-3 \quad -5 \quad -5$

$v^2 - 3v - 5 - \frac{5}{v-6}$

6) $(6a^4 + 21a^3 + 11a^2 + 11a + 11) \div (a + 3)$

$-3$ | $6 \quad 21 \quad 11 \quad 11 \quad 11$

$+ \downarrow \quad -18 \quad -9 \quad -6 \quad -15$

$6 \quad 3 \quad 2 \quad 5 \quad -4$

$6a^3 + 3a^2 + 2a + 5 - \frac{4}{a+3}$

**State if the given ~~binomial is a factor~~ of the given polynomial.**

7) $(b^3 + 5b^2 - 26b - 16) \div (b + 8)$

$-8$ | $1 \quad 5 \quad -26 \quad -16$

$+ \downarrow \quad -8 \quad 24 \quad 16$

$1 \quad -3 \quad -2 \quad 0$

Yes

8) $(5m^3 + 12m^2 - 29m + 15) \div (m + 4)$

$-4$ | $5 \quad 12 \quad -29 \quad 15$

$+ \downarrow \quad -20 \quad 32 \quad -12$

$5 \quad -8 \quad 3 \quad 3$

No

**State the number of roots for each equation.**

9) $x^3 - 1 = 0$

Degree: 3

According to FTA: 3

10) $x^4 - x^2 - 20 = 0$

Degree: 4

According to FTA: 4

**State the POSSIBLE rational zeros for each function.**

11) $f(x) = 9x^3 + 24x^2 + 12x - 7$

| P: -7 | Factors $\pm 1, \pm 7$ |
|---|---|
| q: 9 | $\pm 1, \pm 3, \pm 9$ |

Possible zeros: $\pm 1, \pm 7, \pm \frac{1}{3}, \pm \frac{7}{3}, \frac{\pm 1}{9}, \frac{\pm 7}{9}$

12) $f(x) = 2x^3 + x^2 - 20x - 25$

| P: -25 | Factors $\pm 1, \pm 5, \pm 25$ |
|---|---|
| q: 2 | $\pm 1, \pm 2$ |

Possible zeros: $\pm 1, \pm 5, \pm 25, \pm \frac{1}{2}, \pm \frac{5}{2}, \pm \frac{25}{2}$

**A polynomial function with rational coefficients has the follow zeros. Find all additional zeros.**

13) $2 + \sqrt{10}, \ 2 + 3i$

CTR: $2 - \sqrt{10}, \ 2 - 3i$

14) $3 + 2\sqrt{2}, \ -i$

CTR: $3 - 2\sqrt{2}, \ +i$

15) $1 + \sqrt{7}, \ i$

CTR: $1 - \sqrt{7}, \ -i$

**Write a polynomial function of least degree with integral coefficients that has the given zeros.**

16) $5, \ -1 - 2i$

CTR: $+2i$

$(x-5)(x+1)(x-2i)(x-(-2i))$

$(x^2-4x-5)(x-2i)(x+2i)$

$(x^2-4x-5)(x^2-4i^2)$

$(x^2-4x-5)(x^2+4)$

$x^4-4x^3-5x^2+4x^2-16x-20$

$x^4-4x^3-x^2-16x-20$

17) $0, \ 3, \ -5$

$x(x-3)(x+5)$

$x(x^2-3x+5x-15)$

$x(x^2+2x-15)$

$x^3+2x^2-15x$

18) $4, \ \sqrt{10}$

CTR: $-\sqrt{10}$

$(x-4)(x-(\sqrt{10}))(x-(-\sqrt{10}))$

$(x-4)(x-\sqrt{10})(x+\sqrt{10})$

$(x-4)(x^2-10)$

$x^3-10x-4x^2+40$

$x^3-4x^2-10x+40$

19) $5, \ -2i$

CTR: $+2i$

$(x-5)(x-2i)(x-(-2i))$

$(x-5)(x-2i)(x+2i)$

$(x-5)(x^2-4i^2)$

$(x-5)(x^2+4)$

$x^3+4x-5x^2-20$

$x^3-5x^2+4x-20$

**State the possible rational zeros for each function. Then find all zeros.**

20) $f(x) = x^3 - 2x^2 + 2x - 4$

Possible: $\pm 1, \pm 2, \pm 4$

p: -4

q: 1

$x = 2$

$x = i\sqrt{2}$

$x = -i\sqrt{2}$

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

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

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

$\frac{-0 \pm \sqrt{0-8}}{2}$

$\frac{\pm 2i\sqrt{2}}{2} = \pm i\sqrt{2}$

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

Possible: $\pm 1, \pm 5$

p: -5

q: 1

$x = -1$

$x = i\sqrt{5}$

$x = -i\sqrt{5}$

$(x^3 + x^2)(-5x - 5) = 0$

$x^2(x+1) - 5(x+1)$

$(x^2 - 5)(x+1)$

$x^2 - 5$

$\frac{0 \pm \sqrt{0-20}}{2}$

$\frac{0 \pm 2i\sqrt{5}}{2} = \pm i\sqrt{5}$

22) $f(x) = x^4 + 2x^2 - 24$

Possible: $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 8, \pm 12, \pm 24$

p: -24

q: 1

$x = 2$

$x = -2$

$x = i\sqrt{6}$

$x = -i\sqrt{6}$

$(x^2 - 4)(x^2 + 6) = 0$

$(x+2)(x-2)(x^2+6)$

$x^2 + 6$

$\frac{0 \pm \sqrt{0-24}}{2}$

$\frac{\pm 2i\sqrt{6}}{2}$ $\pm i\sqrt{6}$

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

Possible: $\pm 1, \pm 5$

p: -5

q: 1

$x = 5$

$x = +i$

$x = -i$

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

$x^2(x-5) + (x-5)$

$(x^2+1)(x-5)$

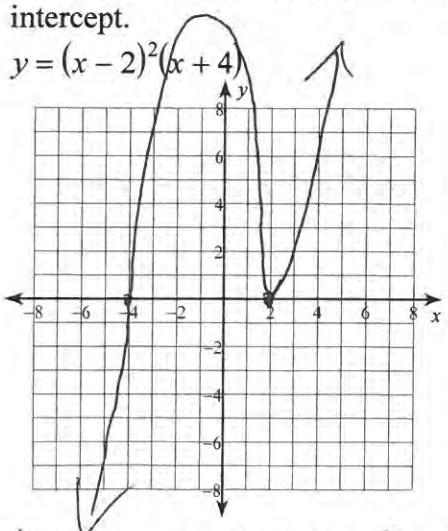
$x^2 + 1$

$\frac{0 \pm \sqrt{0-4}}{2} = \frac{\pm 2i}{2}$

$= \pm i$

24) Graph the equation. Identify the x intercepts and their multiplicity. Describe if the graph bounces off or goes through at each intercept.

$y = (x-2)^2(x+4)$

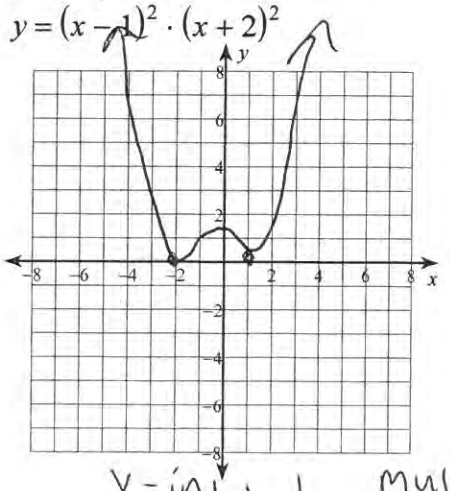



X-int: 2 multiplicity: 2 bounces

-4 multiplicity: 1 passes through

25) Graph the equation. Identify the x intercepts and their multiplicity. Describe if the graph bounces off or goes through at each intercept.

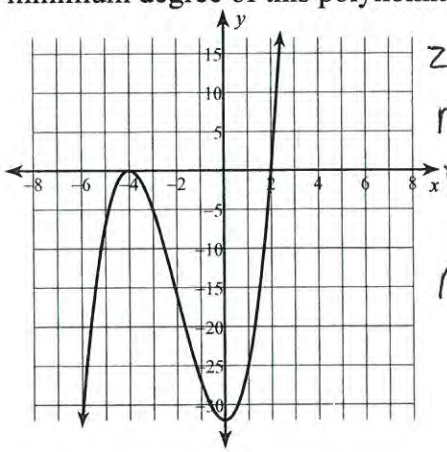
$y = (x-1)^2 \cdot (x+2)^2$




X-int: 1 mult: 2 both bounce

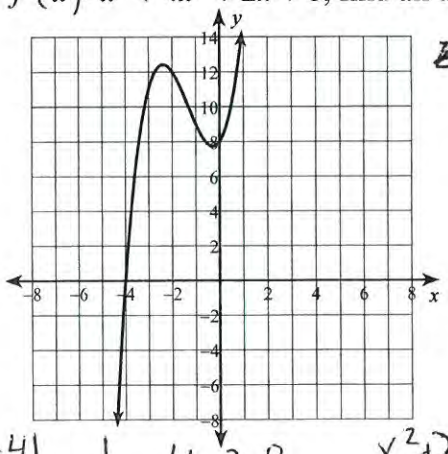
-2 mult: 2

26) Given the graph below, identify the zeroes and their multiplicity. Based on the zeroes, what factors do you know and what is the minimum degree of this polynomial.



zeros: -4, 2
mult: Even, odd
known factors: $(x+4)^2(x-2)$
Min degree: 3

27) Given this graph of $f(x) = x^3 + 4x^2 + 2x + 8$, find all the zeroes.

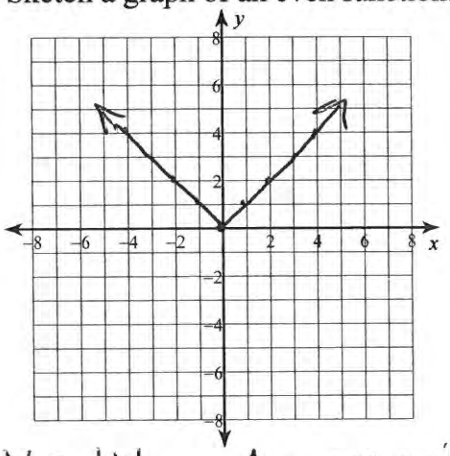


$x = -4$
$x = i\sqrt{2}$
$x = -i\sqrt{2}$

$-4 \mid 1 \quad 4 \quad 2 \quad 8$
$\quad\quad\downarrow \quad -4 \quad 0 \quad -8$
$\quad\quad 1 \quad 0 \quad 2 \quad 0$

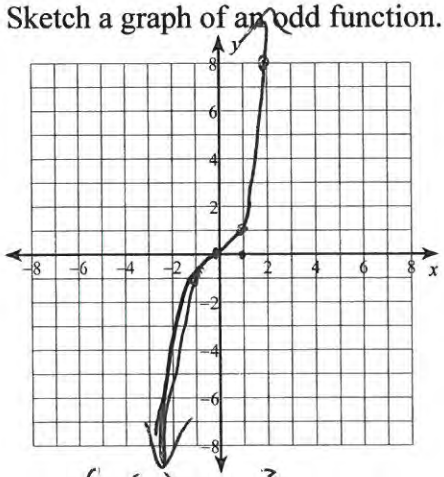
$x^2 + 2 = 0$
$x^2 = -2$
$x = \pm i\sqrt{2}$

28) Sketch a graph of an even function.



$y = |x|$ Answers will Vary

29) Sketch a graph of an odd function.



$f(x) = x^3$

30) Determine algebraically if each polynomial functions is even, odd, or neither.
$y = x^3 + x - 1$

$f(x) = f(-x)$

$f(1) = 1$
$f(-1) = -3$
$f(1) \neq f(-1)$ Not Even
$f(-1) \neq -f(1)$ Not Odd
Neither

31) Determine algebraically if each polynomial functions is even, odd, or neither.
$y = 2x^4 + 3x^2 - 12$

$f(1) = -7$
$f(-1) = -7$
$f(1) = f(-1)$
Even