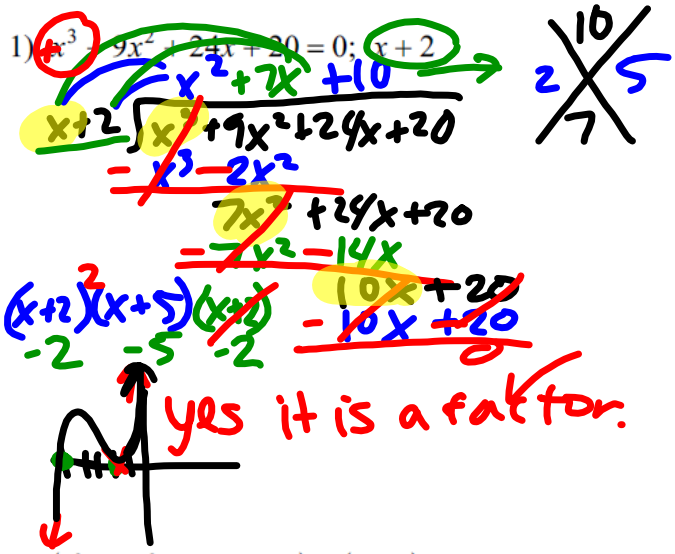
# 3.6 Remainder Theorem Worksheet

Period_

**Is the given a divisor a Factor? Yes or No. Show long division.**

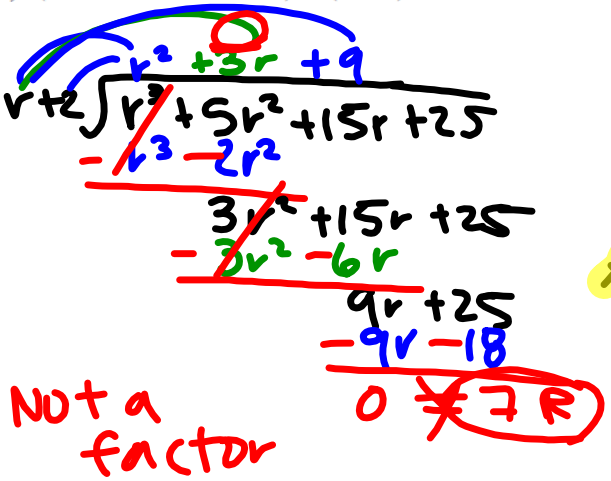
1) $x^3 + 9x^2 + 24x + 20 = 0;\ x + 2$



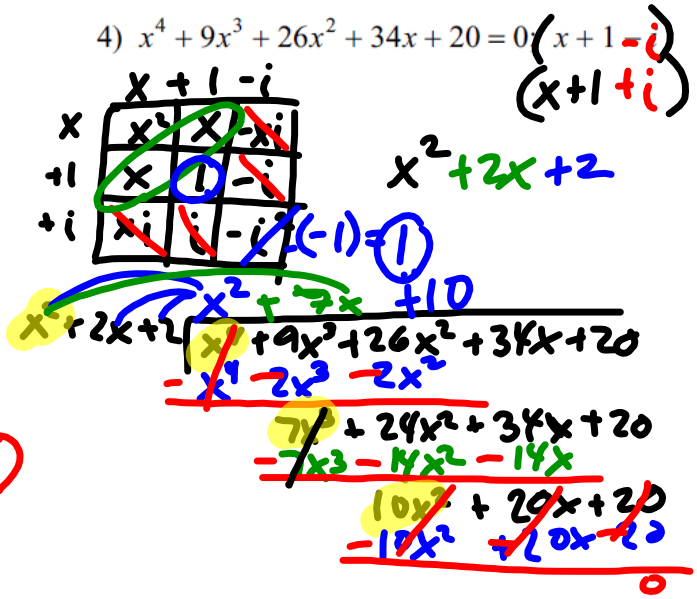

2) $x^3 + 3x^2 - 24x - 80 = 0;\ x - 5$



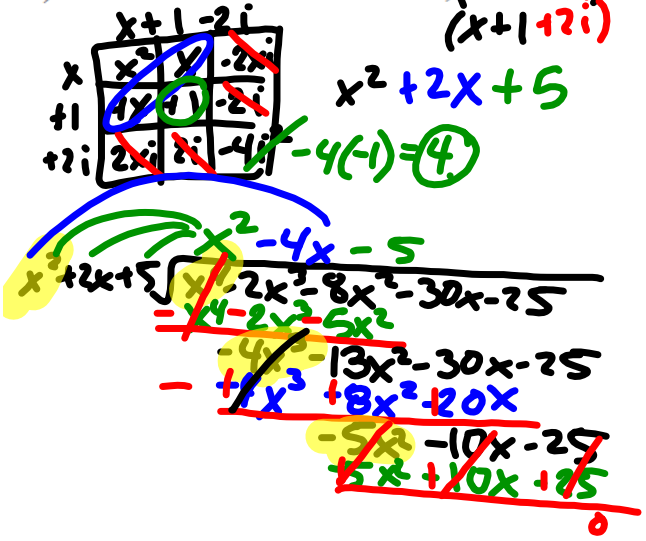

3) $(r^3 + 5r^2 + 15r + 25) \div (r + 2)$



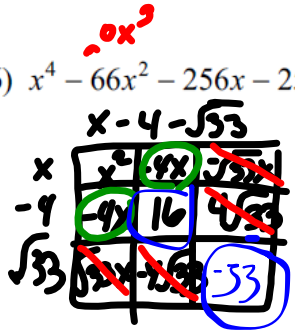

4) $x^4 + 9x^3 + 26x^2 + 34x + 20 = 0;\ (x + 1 - i)$



5) $x^4 - 2x^3 - 8x^2 - 30x - 25 = 0$; $(x+1-2i)$ $(x+1+2i)$



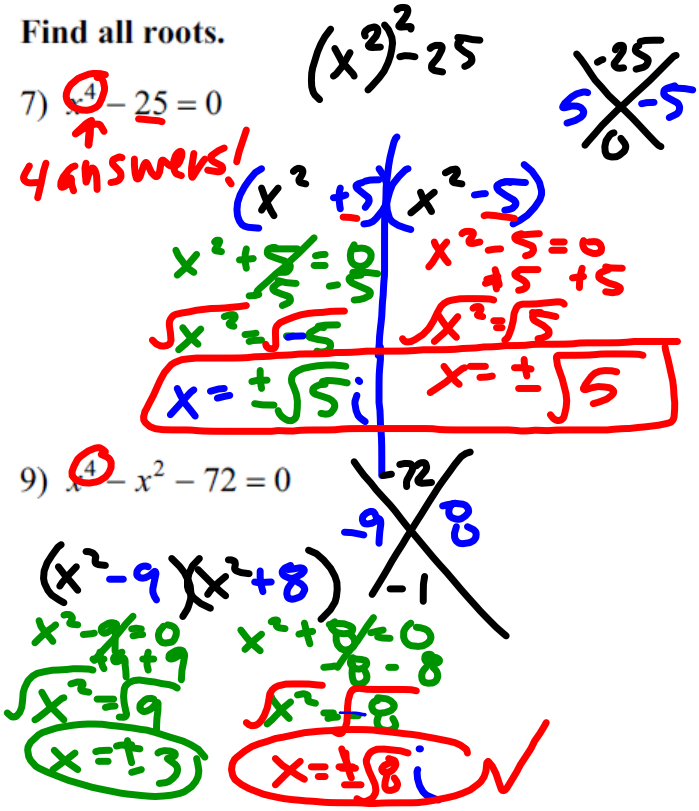

6) $x^4 - 66x^2 - 256x - 255 = 0$; $(x-4-\sqrt{33})$ $(x-4+\sqrt{33})$



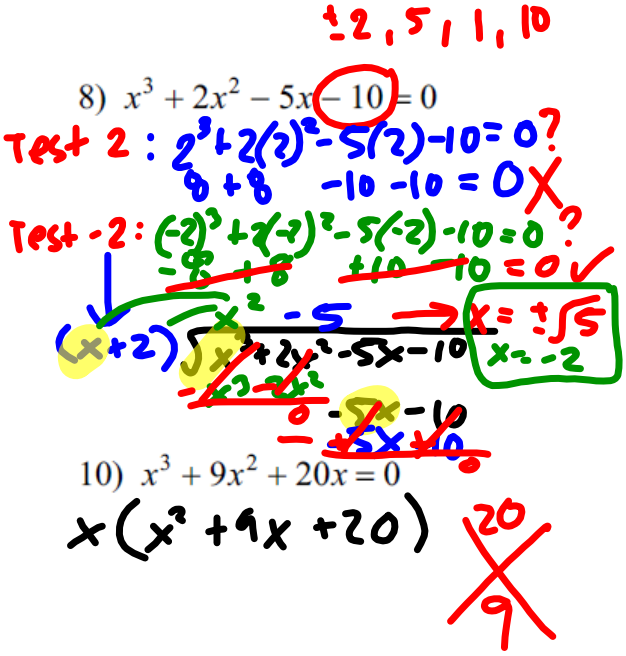

$x^2 - 8x - 17 \overline{)\, x^4 + 0x^3 - 66x^2 - 256x - 255}$

**Find all roots.**

7) $x^4 - 25 = 0$




8) $x^3 + 2x^2 - 5x - 10 = 0$




9) $x^4 - x^2 - 72 = 0$




10) $x^3 + 9x^2 + 20x = 0$

11) Solve for x:

$x^2 - 6x + 2 = 0$

$a=1,\ b=-6,\ c=2$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$= \frac{-(-6) \pm \sqrt{(-6)^2-4(1)(2)}}{2(1)}$

$\frac{6 \pm \sqrt{36-8}}{2}$

$\frac{6 \pm \sqrt{28}}{2}$ $\quad 28 = 4 \cdot 7$

$\frac{6 \pm 2\sqrt{7}}{2}$

$x = 3 \pm \sqrt{7}$ $\quad (x-3+\sqrt{7})(x-3+\sqrt{7})$

CAN'T

**Remainder Theorem**

12) How can you predict whether a factor will divide evenly or not?

Test your prediction:

I. List the possible factors of

$f(x) = x^3 - 6x^2 + 12x - 8$

$\pm 2, \pm 4, \pm 1, \pm 8$

II. Test 3 of the possible factors.

a. f( 1 ) =

b. f( 2 ) =

c. f( 4 ) =

III. Test 1 impossible factor.

d. f( 5 ) =

**Evaluate each function at the given value AND state whether or not it is a zero.**

13) $f(a) = 2a^3 - 10a^2 + 14a - 17$ at $a = 3$

$2(3)^3 - 10(3)^2 + 14(3) - 17 = 0$?

$54 \quad -90 \quad 42 \quad -17 = -11 \neq 0$

NO!

14) $f(x) = 5x^3 + 14x^2 - 6x$ at $x = -3$

15) $f(a) = a^3 - 3a^2 - 18a$ at $a = -3$

16) $f(m) = m^3 + 2m^2 - 13m - 20$ at $m = -4$

17) $f(n) = n^3 + n^2 - 12n + 6$ at $n = 3$

**Write a polynomial function of least degree that has real coefficients, the following zeros, and a leading coefficient of 1.**

18) $-1,\ -2i,\ 2i$

19) $3,\ 5,\ -4,\ -1$

20) $-3,\ 3+\sqrt{7}$ $3-\sqrt{7}$

$(x+3)(x-3+\sqrt{7})(x-3-\sqrt{7})$

21) ~~$-5$~~, $-2,\ -2+3i$, $-2-3i$

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

$x^2+2x+5x+10$

$(x^2+7x+10)$

| | $x^2$ | $2x$ | $-3xi$ |
|---|---|---|---|
| $x$ | $x^2$ | $2x$ | $-3xi$ |
| $2$ | $2x$ | $4$ | $-6i$ |
| $3i$ | $3xi$ | $6i$ | $9$ |

$(x^2+4x+13)$

| | $x^2$ | $4x$ | $13$ |
|---|---|---|---|
| $x^2$ | $x^4$ | $4x^3$ | $13x^2$ |
| $7x$ | $7x^3$ | $28x^2$ | $91x$ |
| $10$ | $10x^2$ | $40x$ | $130$ |

Standard form

$x^4+11x^3+51x^2+131x+130$

**Perform the indicated operation.**

22) $g(x) = 2x + 4$
$h(x) = 2x^3 - 3x$
Find $g(x) \cdot h(x)$
$(2x+4)(2x^3-3x)$

23) $g(x) = 3x + 5$
$h(x) = x + 4$
Find $g(x) - h(x)$
$(3x+5)-(x+4)$
$3x+5-x-4$
$2x+1$

24) $g(t) = t^3 + t$
$h(t) = t - 1$
Find $g(t) - h(t)$

25) $h(t) = -t^3 - 4t$
$g(t) = 3t - 2$
Find $h(t) \cdot g(t)$

26) $h(x) = x^2 + 3$
$g(x) = 4x - 1$
Find $h(x) + g(x)$

27) $f(x) = -3x^3 + 5$
$g(x) = 3x + 1$
Find $f(x) \cdot g(x)$