Name: Key Review Math 3 Honors

Perform the indicated operations:

1.) $2(3a^2 + a - 6) + (-a - a^2 + 1)$

$6a^2 + 2a - 12$

$-a^2 - a + 1$

$5a^2 + a - 11$

2.) $(5a^3 - 4a^2 - a) - 3(a + 6 - 2a^2)$

$-a \quad -4a^2$

$-3a - 18 + 6a^2$

$5a^3 + 2a^2 - 4a - 18$

3.) $\frac{3-2i}{9i} \cdot \frac{-i}{-i} = \frac{-3i + 2i^2}{-9i^2} = \frac{-2-3i}{9}$

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

$(6i + 3i^2)$

$(6i - 3)(3 - 4i)$

$18i - 24i^2 - 9 + 12i$

$+24$

$15 + 30i$

4a) $\frac{(4+3i)}{2-3i} \cdot \frac{(2+3i)}{2+3i} = \frac{8 + 9i^2 + 12i + 6i}{4+9} = \frac{-1+18i}{13}$

-9

4b) $2i^{84} - 2i^{107}$

$2(1) + 2i$

$2 + 2i$

$4\overline{)107}$ 26, 8, 27, 24, 3

$i^3 = -i$

Solve:

5.) $x^3 - 9x^2 + 20x = 0$

$x(x^2 - 9x + 20) = 0$

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

$\{0, 4, 5\}$

6.) $(x^2 + 9)^4(x^2 - 5) = 0$

$x^2 = -9 \quad x^2 = 5$

$x = \pm 3i$ mult:4 $\quad x = \pm\sqrt{5}$

$\{\pm 3i \text{ mult:4}, \pm\sqrt{5}\}$

7.) $3x^2(x + 12)^2(x - 5) = 0$

$\{0 \text{ mult:2}, -12 \text{ mult:2}, 5\}$

8.) $x^4 + 9x^2 + 20 = 0$

$(x^2 + 4)(x^2 + 5) = 0$

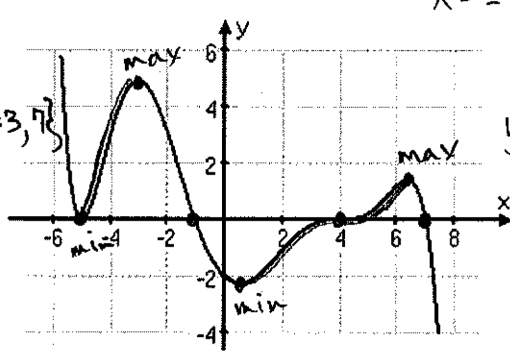
$x^2 = -4 \quad x^2 = -5$

$x = \pm 2i \quad x = \pm i\sqrt{5}$

$\{\pm 2i, \pm i\sqrt{5}\}$

Given:

9.)



Roots & multiplicity if any:
$\{-5 \text{ mult:2}, -1, 4 \text{ mult:3}, 7\}$

Domain (interval notation)
$(-\infty, \infty)$

Maximum (local)
$(-3, 5)$ and $(6.5, 1.5)$

End behavior:
$x \to \infty \quad y \to -\infty$
$x \to -\infty \quad y \to \infty$

write in terms of its linear factors:
$y = (x+5)^2(x+1)(x-4)^3(x-7)$

Range (interval notation) $(-\infty, \infty)$

Increasing: $(-5, -3) \cup (1.5, 6.5)$

minimun: $(-5, 0)$ and $(1.5, -2.25)$

Given the roots of a polynomials function write the function is standard form.MUST SHOW WORK!

10.) x = -1 with multiplicity of 3

$y = (x+1)^3 = (x+1)(x+1)(x+1)$

$y = (x^2 + 2x + 1)(x+1)$

$y = x^3 + x^2 + 2x^2 + 2x + x + 1$

$y = x^3 + 3x^2 + 3x + 1$

11.) x = 7 and x = -2*i* $\quad x = 2i$

$y = (x-7)(x+2i)(x-2i)$

$-4i^2$

$y = (x-7)(x^2+4)$

$y = x^3 - 7x^2 + 4x - 28$

12.) Given: $f(x) = x^4 + 2x^3 + 5x^2 + 8x + 4$ with a root of x = -1 with a multiplicity of two, find the remaining solutions: !

$-1)\ 1\ \ 2\ \ 5\ \ 8\ \ 4$
$\downarrow\ -1\ -1\ -4\ -4$
$1\ \ +1\ \ 4\ \ 4\ \lfloor 0$

$-1)\ 1\ \ 1\ \ 4\ \ 4$
$\downarrow\ -1\ \ 0\ -4$
$1\ \ 0\ \ 4\ \lfloor 0$

$x^2 + 4 = 0$
$\sqrt{x^2} = \sqrt{-4}$
$x = \pm 2i$

* 13.) **List all** possible rational roots using the rational root theorem: SHOW YOUR WORK

$y = 6x^4 - 2x^2 + 2x - 9$

$p = 9 \quad \pm 1, \pm 3, \pm 9$
$q = 6 \quad \pm 1, \pm 2, \pm 3, \pm 6$

Possibles: $\pm 1, \pm 3, \pm 9, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{9}{2}, \pm \frac{1}{3}, \pm \frac{1}{6}$

14.) One factor of $x^3 + 3x^2 + x + 3$ *is* $(x + 3)$ factor completely:

$(x+3)(x^2+1)$

$(x+3)(x+i)(x-i)$ ← or

$-3)\ 1\ \ 3\ \ 1\ \ 3$
$\downarrow\ -3\ \ 0\ -3$
$1\ \ 0\ \ 1\ \lfloor 0$

$x^2 + 1 = 0$
$\sqrt{x^2} = \sqrt{-1}$
$x = \pm i$

15.) Divide using long division: $(3x^4 + 2x^3 - 8x - 48)\,by\,(x^2 - 4)$

$3x^2 + 2x + 12$

$x^2 - 4 \,\overline{)\,3x^4 + 2x^3 + 0x^2 - 8x - 48}$
$-\ 3x^4 \qquad +12x^2$
$2x^3 + 12x^2$
$-2x^3 \qquad +8x$

$12x^2 - 48$
$12x^2 - 48$

16.) Find $p(-2)$ *when* $p(x) = 3x^4 + 5x^3 + x - 3$

$p(-2) = 3(-2)^4 + 5(-2)^3 + (-2) - 3$
$= 48 - 40 - 5$
$p(-2) = 8 - 5 = 3$

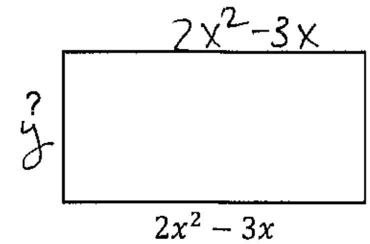
Check:
$-2)\ 3\ \ 5\ \ 0\ \ 1\ -3$
$\downarrow\ -6\ \ 2\ -4\ \ 6$
$3\ -1\ \ 2\ -3\ \lfloor 3$

17) divide $9x^{102} - 7x^{51} + 12x^{31} - 2x^{22} + 6$ *by* $(x + 1)$ *what will be the remainder?*

$p(-1) = 8$

102 101 100-52 51 50 49 48-32 31 30 29-23 22 21-1
$-1)\ 9\ \ 0\ \ 0\ -7\ \ 0\ \ 0\ \ 0\ \ 12\ \ 0\ \ 0\ -2\ \ 0\ \ 6$
$\downarrow\ -9\ \ 9\ -9\ \ 16\ -16\ \ 16\ -16\ \ 4\ -4\ \ 4\ -2\ \ 2$
$9\ -9\ \ 9\ -16\ \ 16\ -16\ \ 16\ -4\ \ 4\ -4\ \ 2\ -2\ \lfloor 8$

18) Perimeter is $26x^2 - 12x + 4$, find the length of the missing side?



$26x^2 - 12x + 4 = 2(2x^2 - 3x) + 2y$
$= 4x^2 - 6x + 2y$
$-4x^2 + 6x \qquad -4x^2 + 6x$

$\frac{22x^2}{2} - \frac{6x}{2} + \frac{4}{2} = \frac{2y}{2}$

$y = 11x^2 - 3x + 2$