Honors Math 3 - Complex Numbers Review

1) $-4(-4i)$

$16i$

2) $(3i)(2+6i)$

$6i+18i^2$ ★remember that "i^2" is -1

$6i+18(-1)$

$-18+6i$

3) $(3i)^2$

$9i^2$

$9(-1)$

-9

4) $(3i)(-5-7i)$

$-15i-21i^2$

$-15i-21(-1)$

$21-15i$

5) $(-8-2i)^2$

$(-8-2i)(-8-2i)$

$64+16i+16i+4i^2$

$64+32i+4(-1)$

$60+32i$

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

$-12+9i+16i-12i^2$

$-12+25i-12(-1)$

$25i$

7) $(8+4i)(-1-6i)$

$-8-48i-4i-24i^2$

$-8-52i-24(-1)$

$16-52i$

8) $(-5+3i)^2$

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

$25-15i-15i+9i^2$

$25-30i+9(-1)$

$16-30i$

9) $\frac{-2-9i}{-4i}$ ★remember that we can't leave "i" in the denominator

$\frac{-2-9i}{-4i}\cdot\frac{i}{i}$

$\frac{-2i-9i^2}{-4i^2}$

$\frac{-2i-9(-1)}{-4(-1)}$

$\frac{9-2i}{4}$

10) $\frac{1-i}{-i}\cdot\frac{i}{i}$

$\frac{i-i^2}{-i^2}$

$\frac{i-(-1)}{-(-1)}$

$\frac{1+i}{1}$

$1+i$

11) $-\frac{4}{i}\cdot\frac{i}{i}$

$\frac{-4i}{i^2}$

$\frac{-4i}{-1}$

$4i$

(12) $\frac{6i}{10-2i}$ *Must rationalize the denominator by multiplying by the conjugate

$\frac{6i}{10-2i} \cdot \frac{10+2i}{10+2i}$

$\frac{60i+12i^2}{100+20i-20i-4i^2}$

$\frac{60i+12(-1)}{100-4(-1)}$

$\frac{-12+60i}{104}$

*Reduce!

$\boxed{\frac{-3+15i}{26}}$

(13) $\frac{9i}{-9-8i} \cdot \frac{-9+8i}{-9+8i}$

$\frac{-81i+72i^2}{81-72i+72i-64i^2}$

$\frac{-81i+72(-1)}{81-64(-1)}$

$\boxed{\frac{-72-81i}{145}}$

(14) $\frac{1}{3-2i} \cdot \frac{3+2i}{3+2i}$

$\frac{3+2i}{9+6i-6i-4i^2}$

$\frac{3+2i}{9-4(-1)}$

$\boxed{\frac{3+2i}{13}}$

(15) $n^2+2n-1=8$

$n^2+2n=9$

$n^2+2n+\underline{1}=9+\underline{1}$

$(n+1)^2=10$

$n+1=\pm\sqrt{10}$

$n=-1\pm\sqrt{10}$

(16) $x^2+10x+16=6$

$x^2+10x=-10$

$x^2+10x+\underline{25}=-10+\underline{25}$

$(x+5)^2=15$

$x+5=\pm\sqrt{15}$

$\boxed{x=-5\pm\sqrt{15}}$

(17) $2a^2+16a+78=-3$

$2a^2+16a=-81$

★cannot complete the square with a leading coefficient so we must divide everything by 2★

$a^2+8a=-\frac{81}{2}$

$a^2+8a+\underline{16}=-\frac{81}{2}+\underline{16}$

$(a+4)^2=-\frac{49}{2}$

$a+4=\pm\sqrt{\frac{-49}{2}}$ ★remember radical rules!

$a+4=\pm\frac{\sqrt{-49}}{\sqrt{2}}$

$a+4=\pm\frac{7i}{\sqrt{2}}$

$a=-4\pm\frac{7i}{\sqrt{2}}$ ★get a common denominator

$a=\frac{-4\sqrt{2}}{\sqrt{2}}\pm\frac{7i}{\sqrt{2}}$ ★combine to one fraction

$a=\frac{-4\sqrt{2}\pm7i}{\sqrt{2}}$ ★remember that we can't leave a radical in the denominator! rationalize!

$a=\frac{-4\sqrt{2}\pm7i}{\sqrt{2}}\cdot\frac{\sqrt{2}}{\sqrt{2}}$

$a=\frac{-4(2)\pm7i\sqrt{2}}{2}$

$$a=\frac{-8\pm7i\sqrt{2}}{2}$$

(18) $9v^2+18v+11=-10$

$9v^2+18v=-21$

★÷ everything by 9★

$v^2+2v=-\frac{21}{9}$

$v^2+2v+\underline{1}=\frac{-7}{3}+\underline{1}$

$(v+1)^2=-\frac{4}{3}$

$v+1=\pm\sqrt{\frac{-4}{3}}$

$v+1=\pm\frac{\sqrt{-4}}{\sqrt{3}}$

$v+1=\pm\frac{2i}{\sqrt{3}}$

$v=-1\pm\frac{2i}{\sqrt{3}}$ ★get a common denom

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

$v=\frac{-\sqrt{3}\pm2i}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}$

$$v=\frac{-3\pm2i\sqrt{3}}{3}$$

9) $8x^2+16x+44=-2$

$8x^2+16x=-46$

$x^2+2x=-46/8$

$x^2+2x+\underline{1}=\frac{-23}{4}+\underline{1}$

$(x+1)^2=\frac{-19}{4}$

$x+1=\pm\sqrt{\frac{-19}{4}}$

$x+1=\pm\frac{\sqrt{-19}}{\sqrt{4}}$

$x=-1\pm\frac{i\sqrt{19}}{2}$ * get a common denominator

$x=\frac{-2}{2}\pm\frac{i\sqrt{19}}{2}$

$$x=\frac{-2\pm i\sqrt{19}}{2}$$

(20) $9m^2 - 18m - 34 = -7$

$9m^2 - 18m = 27$

$m^2 - 2m = 3$

$m^2 - 2m + \underline{1} = 3 + \underline{1}$

$(m-1)^2 = 4$

$m - 1 = \pm 2$

$m = 1 \pm 2$

$m = 3 \quad m = -1$

(21) $3a^2 - 92 = -11a$

$3a^2 + 11a - 92 = 0$

$a = 3$, $b = 11$, $c = -92$

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

$$x = \frac{-11 \pm \sqrt{11^2 - 4(3)(-92)}}{2(3)}$$

$$x = \frac{-11 \pm \sqrt{1225}}{6}$$

$$x = \frac{-11 \pm 35}{6}$$

$x = 4$

$x = -\frac{23}{3}$

(22) $7x^2 + 4 = 4x$

$7x^2 - 4x + 4 = 0$

$a = 7$, $b = -4$, $c = 4$

$$x = \frac{4 \pm \sqrt{(-4)^2 - 4(7)(4)}}{2(7)}$$

$$x = \frac{4 \pm \sqrt{-96}}{14}$$

$$x = \frac{4 \pm i\sqrt{96}}{14}$$

* must "break down" the radical:

96 = 8 · 12; 8 = 4 · 2; 4 = 2 · 2; 12 = 6 · 2; 6 = 3 · 2

$$x = \frac{4 \pm 4i\sqrt{6}}{14}$$

* reduce!

$$x = \frac{2 \pm 2i\sqrt{6}}{7}$$

(23) $9k^2 = -10$

$9k^2 + 10 = 0$

$a = 9$ $b = 0$ $c = 10$

$$x = \frac{0 \pm \sqrt{0^2 - 4(9)(10)}}{2(9)}$$

$$x = \frac{\pm\sqrt{-360}}{18}$$

$$x = \frac{\pm i\sqrt{360}}{18}$$

* must "break down" the radical:

360 = 36 · 10; 36 = 6 · 6; 10 = 5 · 2; 6 = 3 · 2

$$x = \frac{\pm 6i\sqrt{10}}{18}$$

* reduce!

$$x = \frac{\pm i\sqrt{10}}{3}$$

(24) $3p^2 = -12 + 4p$

$3p^2 - 4p + 12 = 0$

$a = 3$
$b = -4$
$c = 12$

$$x = \frac{4 \pm \sqrt{(-4)^2 - 4(3)(12)}}{2(3)}$$

$$x = \frac{4 \pm \sqrt{-128}}{6}$$

$$x = \frac{4 \pm i\sqrt{128}}{6}$$

$$x = \frac{4 \pm 8i\sqrt{2}}{6}$$

* reduce!

$$x = \frac{2 \pm 4i\sqrt{2}}{3}$$

* break down the radical: