

Name _____
Date _____ Period _____

Advanced Algebra Complex Numbers Review

Simplify the following radicals.

<p>1) $\sqrt{-80}$</p> <p style="text-align: center;"> $\begin{array}{c} \wedge \\ 10 \ 8 \\ \swarrow \ \searrow \\ 5 \ 2 \ 4 \ 2 \\ \swarrow \ \searrow \\ 2 \ 2 \end{array}$ </p> <p style="text-align: center;">$4i\sqrt{5}$</p>	<p>2) $-2\sqrt{-72}$</p> <p style="text-align: center;"> $\begin{array}{c} \wedge \\ 36 \ 2 \\ \swarrow \ \searrow \\ 6 \ 6 \end{array}$ </p> <p style="text-align: center;">$-12i\sqrt{2}$</p>	<p>3) $9\sqrt{-49}$</p> <p style="text-align: center;">$9(-7i)$</p> <p style="text-align: center;">$63i$</p>
<p>4) $\sqrt{\frac{-96}{64}}$</p> <p style="text-align: center;"> $\begin{array}{c} \wedge \\ 16 \ 6 \\ \swarrow \ \searrow \\ 4 \ 4 \end{array}$ </p> <p style="text-align: center;">$\frac{4i\sqrt{6}}{8} = \frac{i\sqrt{6}}{2}$</p> <p style="text-align: center;">$\frac{i\sqrt{6}}{2}$</p>	<p>5) $\sqrt{\frac{126}{36}}$</p> <p style="text-align: center;"> $\begin{array}{c} \wedge \\ 9 \ 14 \\ \swarrow \ \searrow \\ 3 \ 3 \end{array}$ </p> <p style="text-align: center;">$\frac{3\sqrt{14}}{6} = \frac{\sqrt{14}}{2}$</p> <p style="text-align: center;">$\frac{\sqrt{14}}{2}$</p>	
<p>6) $\sqrt{\frac{-120}{81}}$</p> <p style="text-align: center;"> $\begin{array}{c} \wedge \\ 60 \ 30 \\ \swarrow \ \searrow \\ 2 \ 2 \end{array}$ </p> <p style="text-align: center;">$\frac{2i\sqrt{30}}{9}$</p>	<p>7) $-5\sqrt{-90}$</p> <p style="text-align: center;"> $\begin{array}{c} \wedge \\ 10 \ 9 \\ \swarrow \ \searrow \\ 3 \ 3 \end{array}$ </p> <p style="text-align: center;">$-15i\sqrt{10}$</p>	

Simplify using powers of i:

<p>8) $i^{40} + 6i^{10} - 9i^{20}$</p> <p style="text-align: center;">$1 + 6(-1) - 9(1)$</p> <p style="text-align: center;">$1 - 6 - 9 = \boxed{-14}$</p>	<p>9) i^{250}</p> <p style="text-align: center;">-1</p>
<p>10) $3i^{27}$</p> <p style="text-align: center;">$3(-i) = \boxed{-3i}$</p>	<p>11) $-2i^{100} - 3i^{14}$</p> <p style="text-align: center;">$-2(1) - 3(-1)$</p> <p style="text-align: center;">$-2 + 3 = \boxed{1}$</p>
<p>12) $3i^{22} - 7i$</p> <p style="text-align: center;">$3(-1) - 7i$</p> <p style="text-align: center;">$-3 - 7i$</p>	<p>13) $3i^{272} - 16i^{314}$</p> <p style="text-align: center;">$3(1) - 16(-1)$</p> <p style="text-align: center;">$3 + 16 = \boxed{19}$</p>
<p>14) $-18i^{57}$</p> <p style="text-align: center;">$-18(i) = \boxed{-18i}$</p>	<p>15) $-13i^{55} + 5i^{140} + 8i^{10}$</p> <p style="text-align: center;">$-13(-i) + 5(1) + 8(-1)$</p> <p style="text-align: center;">$13i + 5 - 8 = \boxed{-3 + 13i}$</p>

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Simplify the following expressions.

$$16) (9 - 2i)(1 - 3i)$$

$$9 - 27i - 2i + 6i^2$$

$$\boxed{3 - 29i}$$

$$17) \frac{4 + 6i}{4 - 3i} \cdot \frac{4 + 3i}{4 + 3i}$$

$$= \frac{16 + 12i + 24i + 18i^2}{16 + 12i - 12i + 9i^2} = \frac{-2 + 36i}{25}$$

$$\boxed{\frac{-2 + 36i}{25}}$$

$$18) 5(-2 - 3i) - (-2 + 7i)$$

$$-10 - 15i + 2 - 7i$$

$$\boxed{-8 - 22i}$$

$$19) \frac{2i}{3 + 6i} \cdot \frac{3 - 6i}{3 - 6i} = \frac{6i + 12i^2}{9 - 18i + 18i + 36i^2}$$

$$\frac{12 + 6i}{45} = \boxed{\frac{4 + 2i}{15}}$$

$$20) (7 + 4i)^2$$

$$(7 + 4i)(7 + 4i)$$

$$49 + 28i + 28i + 16i^2$$

$$\boxed{33 + 56i}$$

$$21) -2i(13 + 5i) - 3(14 - 6i)$$

$$-26i + 10i^2 - 42 + 18i$$

$$\boxed{-32 - 8i}$$

$$22) (1 - 6i)(12 - 2i)$$

$$12 - 2i - 72i + 12i^2$$

$$\boxed{-74i}$$

$$23) \frac{(6 + 7i)(1 + 9i)}{(1 - 9i)(1 + 9i)}$$

$$= \frac{6 + 54i + 7i + 63i^2}{1 + 9i - 9i + 81i^2} = \frac{-57 + 61i}{82}$$

$$\boxed{\frac{-57 + 61i}{82}}$$

$$24) -3(-5 - 9i) + (-1 + 7i)$$

$$15 + 27i - 1 + 7i$$

$$\boxed{14 + 34i}$$

$$25) \frac{15i}{5 + 10i} \cdot \frac{5 - 10i}{5 - 10i}$$

$$\frac{75i + 150i^2}{25 - 50i + 50i + 100i^2} \rightarrow \frac{150 + 75i}{125} = \boxed{\frac{6 + 3i}{5}}$$

$$26) (-8 + 3i)^2$$

$$(-8 + 3i)(-8 + 3i)$$

$$64 - 24i - 24i + 9i^2$$

$$\boxed{55 - 48i}$$

$$27) 2i(5 + 2i) - 10(11 - 4i)$$

$$10i + 4i^2 - 110 + 40i$$

$$\boxed{-114 + 50i}$$