

Name: _____

Instructions: Clearly answer each of the questions below. Remember to check the back side. Show your work and any formulas you employ. Simplify all answers as far as possible. Box your answers.

1. (4 pts) Find $(3 - 2i)(-4 + 7i) + 3 + 7i$.

$$(3 - 2i)(-4 + 7i) + 3 + 7i = (-12 + 21i + 8i + 14) + 3 + 7i = 5 + 36j$$

-
2. (4 pts) Find $(\overline{18 - i})/(1 + 2i)$.

$$\frac{\overline{18 - i}}{1 + 2i} = \frac{18 + i}{1 + 2i} = \frac{(18 + i)(1 - 2i)}{(1 + 2i)(1 - 2i)} = \frac{18 - 36i + i + 2}{1 + 4} = \frac{20 - 35i}{5} = 4 - 7i.$$

-
3. (2 pts) Rewrite the complex number $18e^{7\pi i/6}$ in Cartesian form.

$$18(\cos 7\pi/6 + i \sin 7\pi/6) = 18(-\sqrt{3}/2 - i1/2) = -9\sqrt{3} - 9i$$

-
4. (4 pts) Find all distinct cube roots of -1 .

$$\begin{aligned}\sqrt[3]{-1} &= (e^{\pi i + 2\pi\mathbb{Z}})^{1/3} = (e^{\pi i/3 + (2/3)\pi\mathbb{Z}}) \\ \sqrt[3]{-1} &\in \{e^{\pi i/3}, e^{\pi i}, e^{-\pi i/3}\} \\ \sqrt[3]{-1} &\in \left\{ (1 + i\sqrt{3})/2, -1, (1 - i\sqrt{3})/2 \right\}\end{aligned}$$