"Sometimes the questions are complicated and the answers are simple."
−Dr. Seuss (Theodor Seuss Geisel)

Problem 1. (10pt) Is the following statement true or false, explain: for a nonzero real number x and integer n, $x^n = \dfrac{1}{x^{-n}}$.

Problem 2. (10pt) Write the following complex numbers in the form $a + bi$:

(a) $2(1 - 3i) - (6 - 4i)$

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

(c) $(2i)^5$

(d) $\dfrac{5 - i}{1 + 2i}$

Problem 3. (10pt) Write the following numbers in scientific notation as a decimal value:

(a) $5.77 \cdot 10^5$

(b) $-1.41 \cdot 10^{-2}$

(c) $8.9 \cdot 10^0$

(d) $4.5 \cdot 10^{-6}$

Problem 4. (10pt) Write the following decimal numbers in scientific notation:

(a) 34100000

(b) 7.7

(c) 0.6631

(d) 0.0000004

Problem 5. (10pt) Using no negative powers and showing all your work, simplify the following:

(a) $(x^5y^3)^2(x^{10}y^2)^0$

(b) $x^3(x^2y)^2y^3$

(c) $x^3y^8(x^5y^2)^{-2}$

(d) $(xy^4)^{-3}(x^5y^{-3})^{-5}$

Problem 6. (10pt) Using no negative powers and showing all your work, simplify the following:

(a) $\dfrac{x^5 y^7}{x^4 y^{12}}$

(b) $\dfrac{x^8 y^{-3}}{x^{12} y^{-6}}$

(c) $\dfrac{(xy^3)^{-2}}{x^{-5} y^2}$

(d) $\dfrac{x^3 (x^2 y)^0}{y^5 (xy^3)^{-2}}$

Problem 7. (10pt) Using no negative powers, being sure each variable appears only once, and showing all your work, simplify the following:

(a) $xy\sqrt{x^5y^3}$

(b) $\dfrac{y\sqrt{x^5}}{\sqrt{x^3y}}$

(c) $\dfrac{(x^2y^5)^{1/2}}{(x^6y^2)^{-1/3}}$

(d) $(x^{10}y^{-4})^{-1/4}\sqrt{xy}$

Problem 8. (10pt) Showing all your work, simplify the following as much as possible:

(a) $\sqrt{75}$

(b) $\sqrt{250}$

(c) $\sqrt{360}$

(d) $\sqrt{2^7 \cdot 3^3 \cdot 5^2 \cdot 11}$

Problem 9. (10pt) Showing all your work, simplify the following as much as possible:

(a) $\sqrt[3]{40}$

(b) $\sqrt[4]{80}$

(c) $\sqrt[3]{2^8 \cdot 3^2 \cdot 5 \cdot 7^6}$

(d) $\sqrt[5]{2^4 \cdot 5^{10} \cdot 7^5}$

Problem 10. (10pt) Rationalize the following fractions:

(a) $\dfrac{1}{\sqrt{11}}$

(b) $\dfrac{4}{\sqrt{13}}$

(c) $\dfrac{5}{3 + \sqrt{7}}$

(d) $\dfrac{1}{\sqrt[5]{3}}$