Name: _____

MATH 101
Winter 2021
HW 2: Due 01/05

"I don't talk trash, I talk smack. They're totally different. Trash talk is hypothetical, like: your mom is so fat she can eat the internet. But smack talk is happening like right now. Like: you're ugly and I know it for a fact 'cause I got the evidence right there."

–Kelly Kapoor, The Office

Problem 1. (10pt) Showing all your work, simplify the following as much as possible:

(a) $(x^3y^{-1})^4$

(b) $\dfrac{x^5y^{-6}}{x^3y^2}$

(c) $\left(\dfrac{x^{-2}}{y^4}\right)^{-1}$

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

(e) $\dfrac{(x^{-2}y^3)^{-5}xy^6}{x^0y^{-2}}$

Problem 2. (10pt) Showing all your work, simplify the following as much as possible:

(a) $(x^4y^5)^{1/2}$

(b) $\left(\dfrac{\sqrt{x}}{\sqrt[3]{y^2}}\right)^3$

(c) $\dfrac{(x\sqrt{y})^3}{\sqrt{x}\,y^{-3/2}}$

(d) $(\sqrt[3]{xy^2})^2(xy^2)^{1/3}$

(e) $\left(\dfrac{x^6}{y^5}\right)^{-2/3}$

Problem 3. (10pt) Showing all your work, simplify the following as much as possible:

(a) $\sqrt{28}$

(b) $\sqrt{120}$

(c) $\dfrac{\sqrt{90}}{3}$

(d) $\sqrt[3]{360}$

(e) $\sqrt[4]{2^9 \cdot 3^5 \cdot 5^2 \cdot 7^4}$

Problem 4. (10pt) Rationalize the following fractions:

(a) $\dfrac{1}{\sqrt{3}}$

(b) $\dfrac{6}{\sqrt{5}}$

(c) $\dfrac{4}{1+\sqrt{6}}$

(d) $\dfrac{6}{3-\sqrt{7}}$

(e) $\dfrac{1}{\sqrt[3]{12}}$

Problem 5. (10pt) Convert the following numbers from scientific to decimal notation:

(a) $1.5 \cdot 10^4$

(b) $3.19 \cdot 10^{-3}$

(c) $-4.33 \cdot 10^0$

(d) $1.574 \cdot 10^2$

(e) $8.48 \cdot 10^{-6}$

Problem 6. (10pt) Convert the following numbers from decimal to scientific notation:

(a) 14500000

(b) 0.004

(c) 878410

(d) 0.0000077

(e) 1.55

Problem 7. (10pt) Express the following rational numbers as a decimal:

(a) $\frac{3}{8}$

(b) $\frac{13}{4}$

(c) $\frac{4}{5}$

(d) $\frac{1}{9}$

(e) $\frac{4}{33}$

Problem 8. (10pt) Express the following decimal numbers as rational numbers:

(a) -6

(b) 1.4

(c) 0.54

(d) $0.2222\overline{2}$

(e) $0.1010\overline{10}$

Problem 9. (10pt) Showing all your work, compute the following:

(a) $(1 - 5i) + (6 + 8i)$

(b) $(5 + 6i) - 2(4 - i)$

(c) $(3 + i)(4 + 2i)$

(d) $\dfrac{1 + i}{8 + i}$

(e) $(5 - 3i)^2$

Problem 10. (10pt) Simplifying as much as possible, express the following as a single complex number of the form $a + bi$:

(a) 7

(b) $\sqrt{-4}$

(c) $6 - \sqrt{-18}$

(d) $(2i)^3$

(e) $\dfrac{1 + \sqrt{-9}}{3}$