Name: _____
MATH 101
Fall 2021
HW 3: Due 09/24

"People make fun of the guy who stays home every night doing nothing. But the truth is that guy is a genius."
– Ted Mosby, How I Met Your Mother

Problem 1. (2pt) What are the approximate values of π and e?

Problem 2. (2pt) You may have recalled in school that $\pi \approx \frac{22}{7}$. Is it possible to find integers a and b such that $\pi = \frac{a}{b}$? Explain.

Problem 3. (8pt) Express the following rational numbers as a decimal. Show all your work.

(a) $\frac{5}{4} =$

(b) $-\frac{1}{8} =$

(c) $\frac{170}{9} =$

(d) $\frac{13}{99} =$

Problem 4. (8pt) Express the following decimals as rational numbers, reducing your rational expression as much as possible and showing all your work:

(a) $3.0 =$

(b) $-1.5 =$

(c) $1.25 =$

(d) $-0.94 =$

Problem 5. (9pt) Express the following decimals as a rational number, reducing your rational expression as much as possible and showing all your work:

(a) $0.77777\overline{7}$

(b) $0.21212121\overline{21}$

(c) $0.255555\overline{5}$

Problem 6. (3pt) Suppose two paints have to be mixed in a $5:6$ ratio. If you want to use all of the second paint you have in the mix and you have 5.3 gallons of the paint left, how many gallons of the first paint should you add to the mix?

Problem 7. (8pt) Find the following:

(a) 40% of 60

(b) 17% of 55

(c) 120 increased by 12%

(d) 89 decreased by 5%

Problem 8. (6pt) Water is flowing into a tank at a rate of 12 gallons per minute. The tank can hold 1500 gallons and currently contains 86 gallons of water.

(a) How many minutes until the tank overflows?

(b) If the time is currently 5:00 pm, at what time will the tank overflow?

Problem 9. (6pt) The travel distance between Sparkill, NY and Boston, MA is 203 miles. The speed limit on this highway is 65 mph.

(a) How long will it take to travel from Sparkill, NY to Boston, MA using this highway?

(b) Is it possible to make the drive in 3 hours or less without speeding? Explain.

Problem 10. (8pt) Convert the following:

(a) 165 lbs to kg [1 kg $=$ 2.205 lb]

(b) 16 km to miles [1 mi $=$ 1.609 km]

(c) 3.6 ft/s to mph [5280 ft $=$ 1 mi]

(d) 9.8 m/s^2 to ft/hr [1 m $=$ 3.2808 ft]

Problem 11. (8pt) Write the following numbers as complex numbers:

(a) $5 =$

(b) $\sqrt{-4} =$

(c) $\sqrt{16} =$

(d) $1 - \sqrt{-24} =$

Problem 12. (12pt) Compute the following:

(a) $(1 + 3i) + (-6 + 7i) =$

(b) $2i - (8 - 3i) =$

(c) $(1 - i)(6 + i) =$

(d) $(7 + 9i)^2 =$

(e) $\dfrac{10 + i}{1 - i} =$

(f) $\dfrac{16 - 12i}{(2i)^2} =$