

MS 100 Sample Test 2 SOLUTIONS (Sec 1.4-1.7)

01. (04 pts) What is the *standard form* of a complex number?

Let a and b be real numbers:

$a + bi$ is the standard form of a complex number.

a is called the "real part" and $b i$ is called the "imaginary part."

02. (04 pts) Perform the operation and express the answer in standard form: $(6 + 3 i) + (2 - 5 i)$

The operation is addition. Add or subtract the real parts and then add or subtract the imaginary parts.

$$\text{answer} = 8 - 2 i$$

03. (04 pts) Perform the operation and express the answer in standard form: $(6 + 3 i)(2 - 5 i)$

The operation is multiplication. Use the FOIL method:

$$(6 + 3 i)(2 - 5 i) = 12 - 30 i + 6 i - 15 i^2 = 12 - 24 i - 15(-1) = 12 - 24 i + 15 = 27 - 24 i$$

$$\text{answer} = 27 - 24 i$$

04. (04 pts) Perform the operation and express the answer in standard form: $(6 + 3 i) - (2 - 5 i)$

The operation is subtraction. Add or subtract the real parts and then add or subtract the imaginary parts.

$$(6 + 3 i) - (2 - 5 i) = 6 + 3 i - 2 - (-5 i) = 6 + 3 i - 2 + 5 i = 4 + 8 i$$

$$\text{answer} = 4 + 8 i$$

05. (04 pts) Perform the operation and express the answer in standard form: $\frac{(6+3 i)}{(2-5 i)}$

Multiply the fraction by $\frac{(2+5 i)}{(2+5 i)}$ which just equals 1. Note that $(2 - 5 i)(2 + 5 i) = 29$

$$\frac{(6+3 i)}{(2-5 i)} \cdot \frac{(2+5 i)}{(2+5 i)} = \frac{(6+3 i)(2+5 i)}{29} = \frac{12+30 i+6 i+15 i^2}{29} = \frac{12+30 i+6 i+15(-1)}{29} = \frac{-3+36 i}{29} = \frac{-3}{29} + \frac{36}{29} i$$

06. (04 pts) The expression $\sqrt{-24}$ is equivalent to:

a) $-\sqrt{24}$

b) $-i\sqrt{24}$

c) $\pm 2i\sqrt{6}$

d) $2i\sqrt{6}$

This is a multiple choice question. $\sqrt{-24} = i\sqrt{24} = i\sqrt{4*6} = i\sqrt{4} * \sqrt{6} = i2\sqrt{6} = 2i\sqrt{6}$

07. (04 pts) Use the Quadratic Formula to find the imaginary solutions to $2x^2 - 4x + 5 = 0$.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(2)(5)}}{2(2)} = \frac{4 \pm \sqrt{(-4)^2 - 4(2)(5)}}{2(2)} = \frac{4 \pm \sqrt{-24}}{4} = \frac{4 \pm 2i\sqrt{6}}{4} = \frac{4}{4} \pm \frac{2i\sqrt{6}}{4} = 1 \pm \frac{\sqrt{6}}{2} i$$

08. (04 pts) Solve $(x+2)^{\frac{2}{3}} = 9$ Raise both sides to the $\frac{3}{2}$ power. Note: $9^{\frac{3}{2}} = (9^{\frac{1}{2}})^3 = (\sqrt{9})^3 = (3)^3 = 27$

$$((x+2)^{\frac{2}{3}})^{\frac{3}{2}} = 9^{\frac{3}{2}}$$

$$(x+2)^1 = 9^{\frac{3}{2}}$$

$$x = 9^{\frac{3}{2}} - 2 = 27 - 2 = 25$$

09. (04 pts) Solve $\sqrt{2x} - 10 = 0$. $x = \underline{\quad 50 \quad}$

Isolate the $\sqrt{\quad}$ and then square both sides.

$$\sqrt{2x} - 10 = 0$$

$$\sqrt{2x} = 10$$

$$(\sqrt{2x})^2 = (10)^2$$

$$2x = 100$$

$$x = 50$$

10. (04 pts) Solve $\sqrt{5x+1} = \sqrt{3x-7}$. $x = \underline{\quad}$

Square both sides.

$$(\sqrt{5x+1})^2 = (\sqrt{3x-7})^2$$

$$5x+1 = 3x-7$$

$$2x+1 = -7$$

$$2x = -8$$

$$x = -4$$

11. (04 pts) Solve $2x^3 = 8x$. $x = \underline{\quad}$

11. Solution:

$$2x^3 = 8x$$

$$2x^3 - 8x = 0$$

$$2x(x^2 - 4) = 0$$

$$2x(x+2)(x-2) = 0$$

$$x = \{0, -2, 2\}$$

12. (04 pts) Solve $2x^3 = 8$. $x = \underline{\quad}$ Be sure to find ALL complex solutions.

12. Solution for this question will not be provided.

13. (04 pts) Use the compounding formula $A = P(1 + \frac{r}{n})^{nt}$ to determine the value an investment account if \$500 is invested for 7 years, compounded monthly at an APR of 4.9%.

13. Solution: $P = 500$; monthly means $n = 12$; $t = 7$ plug in and calculate: $A = 500(1 + \frac{0.049}{12})^{(12 \cdot 7)} \approx \704.09

14. (04 pts) Use the compounding formula $A = P(1 + \frac{r}{n})^{nt}$ to determine the APR required for an investment to reach a value of \$700 if \$500 is invested for 7 years, compounded quarterly.

14. Solution: $A = 700$; $P = 500$; quarterly means $n = 4$; $t = 7$ solve for r : $700 = 500(1 + \frac{r}{4})^{(4 \cdot 7)}$

$$700 = 500(1 + \frac{r}{4})^{(4 \cdot 7)} \quad \text{divide both sides by 500}$$

$$\frac{700}{500} = (1 + \frac{r}{4})^{28}$$

$$\left(\frac{700}{500}\right)^{\frac{1}{28}} = \left((1 + \frac{r}{4})^{28}\right)^{\frac{1}{28}} \quad \text{raise both sides the reciprocal exponent and apply exponent rules.}$$

$$\left(\frac{700}{500}\right)^{\frac{1}{28}} = 1 + \frac{r}{4} \quad \text{subtract a 1 from both sides}$$

$$\left(\frac{700}{500}\right)^{\frac{1}{28}} - 1 = \frac{r}{4}$$

$$4\left(\left(\frac{700}{500}\right)^{\frac{1}{28}} - 1\right) = r \approx 0.0484 = 4.84\% \quad \text{multiply both sides by 4 and calculate}$$

15. (04 pts) Consider the inequality $2x - 4 < 8$.

a) Solve the inequality.

$$2x - 4 < 8$$

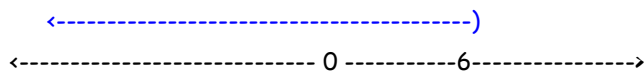
$$2x < 12$$

$$-\infty < x < 6$$

b) Express the answer in *interval notation*.

$$(-\infty, 6)$$

c) Graph the solution on the real number line.



d) Is the solution set BOUNDED or UNBOUNDED?

16. (04 pts) Consider the inequality $-6 \leq 2x - 4 < 8$.

a) Solve the inequality.

$$-6 \leq 2x - 4 < 8$$

$$-2 \leq 2x < 12$$

$$-1 \leq x < 6$$

b) Express the answer in *interval notation*.

$$[-1, 6)$$

c) Graph the solution on the real number line. $\left[\text{-----} \right)$
 $\leftarrow \text{-----} -1 \text{---} 0 \text{-----} 6 \text{-----} \rightarrow$

d) Is the solution set **BOUNDED** or **UNBOUNDED**?

17. (04 pts) Consider the inequality $|2x - 4| < 8$.

a) Solve the inequality.

b) Express the answer in *interval notation*.

$$|2x - 4| < 8 \quad \text{This is "Type 1 Absolute Value Inequality"}$$

$$(-2, 6)$$

$$-8 < 2x - 4 < 8$$

$$-4 < 2x < 12$$

$$-2 < x < 6$$

c) Graph the solution on the real number line. $\left(\text{-----} \right)$
 $\leftarrow \text{-----} -2 \text{---} 0 \text{-----} 6 \text{-----} \rightarrow$

d) Is the solution set **BOUNDED** or **UNBOUNDED**?