

Below is a list of questions and topics that you are responsible for on your midterm examination. Not all topics may be included in your actual midterm. Use this as a study guide. The answer key is found at the end of the review. (Assume all variables with non-integer exponents represent positive values, and denominators are not zero).

Name _____

1. Use the properties of exponents to simplify completely. Express your answer using only positive exponents.

a. $\left(\frac{5a^3}{a^{-5}}\right)^{-3}$ b. 3^{-5} c. $8^{\frac{2}{3}}$ d. $(49x^{-4}y^2)^{\frac{1}{2}}$ e. $(3m^2n)^2 \cdot (2n - 5)^{-2}$

2. Use the properties of radicals to simplify each radical expression completely. Express your answer in simplified radical form. Assume all variables are positive.

a. $\sqrt[3]{54}$ b. $\sqrt{200x^3y^8}$ c. $\sqrt{45}$ d. $\sqrt[3]{8x^4}$

3. Perform the indicated operations. Simplify all answers completely.

a. $(3y^2 - 7y + 3) - (2y^2 + 5) + (4y - 1)$ b. $(2z - 1)(z^2 - 5z + 3)$ c. $(7x - y)^2$
d. $\frac{3a^2 - 5a - 2}{a - 2}$ e. $\frac{6x^3 - 12x^2 - 2x}{-2x}$ f. $(2x - 5)(2x + 5)$

4. Factor the following polynomials completely.

a. $y^2 - 10y + 25$ b. $2x^2 + 5x - 7$ c. $6n^3 + 3n^2 + 8n + 4$
d. $2m^2 + 10m + 12$ e. $9x^2 - 100$ f. $r^3 - 125$ g. $4m^3 + 108$ h. $x^4 - 16y^4$

5. a. Simplify each radical, then if possible combine. Simplify the answer completely.

$$4\sqrt{12} - \sqrt{27} + 2\sqrt{48}$$

Rationalize the denominator and simplify completely.

b. $\sqrt{\frac{2}{5}}$

c. $\frac{5 + \sqrt{2}}{3 - \sqrt{7}}$

6. Solve the following equations.

a. $3m - 5(m + 6) = m + 5$

b. $\frac{2}{3} + x = \frac{1}{5}(x + 4) - 2$

c. $x - 4(x + 5) = -3(x + 7) + 1$

d. $4a^2 - 7a + 6 = 0$

e. $p^2 - 8p - 20 = 0$

f. $(x + 5)^2 + (x - 2)^2 = 37$

g. $3m^2 - 5m = 9$

7. Solve the following absolute value equations.

a. $|4x - 5| + 15 = 36$

b. $6|3x - 12| - 5 = 49$

c. $|2x - 4| + 4 = -9$

8. Solve the following inequalities. Express your solution set using both interval notation and graphically.

a. $-3(x - 5) + 2x > 4x - 7$

b. $6a - (2a + 3) \leq 5(a + 1)$

9. Solve the following absolute value inequalities. Express your solution set using both interval notation and graphically.* (Optional Topic)

a. $|6m - 4| + 5 > 7$

b. $3|4y - 1| \leq 15$

10. Combine the following complex numbers.

a. $(2 - 5i) + (7 + 3i)$

b. $(-3 + 11i) - (6 - 7i)$

c. $(5 - 6i) + (2 - i) - (1 + 3i)$

d. $(4 + 3i) - [(9 - i) - (5 - 6i)]$

11. Find the following product or quotient. Write the answer in standard complex form.

a. $(3 - 8i)(6 + 2i)$

b. $(1 + i)^2$

c. $\frac{3+i}{2i}$

d. $\frac{2+i}{3-2i}$

e. $\frac{5-3i}{5+3i}$

12. a. Simplify completely: $\frac{x^2 - 2x - 3}{2x^2 - 12x + 18}$

13.

Combine the following, simplify completely.

a. $\frac{x-3}{x+1} + \frac{4x+8}{x+1}$

b. $\frac{x-2}{3x} - \frac{4x-1}{3x}$

c. $\frac{5}{x+4} + \frac{2}{x-1}$

d. $\frac{-t}{(t+2)(5t-1)} - \frac{1}{(t+4)(5t-1)}$

e. $\frac{a+2}{a-2} - \frac{a-1}{a^2-4a+4}$

Combine the following, simplify completely.

a. $\frac{\frac{2}{3} + \frac{1}{x}}{\frac{4}{x} + \frac{1}{5}}$

b. $\frac{5 - \frac{2}{x+2}}{3 + \frac{1}{x+2}}$

c. $\frac{\frac{a+2}{2a}}{\frac{a^2-4}{4a^2}}$

ANSWER KEY:

1a. $\frac{8}{125a^{24}b^3c^3}$ b. $\frac{1}{243}$ c. 4 d. $\frac{7y}{x^2}$ e. $\frac{9m^4n^{12}}{4}$

2a. $3\sqrt[3]{2}$ b. $10xy^4\sqrt{2x}$ c. $3\sqrt{5}$ d. $2x\sqrt[3]{x}$

3a. $y^2 - 3y - 3b$ b. $2z^3 - 11z^2 + 11z - 3$ c. $49x^2 - 14xy + y^2$

d. $3a + 1$ e. $-3x^2 + 6x + 1$ f. $4x^2 - 25$

4a. $(y - 5)^2$ b. $(x - 1)(2x + 7)$ c. $(2n + 1)(3n^2 + 4)$ d. $2(m + 2)(m + 3)$

e. $(3x + 10)(3x - 10)$ f. $(r - 5)(r^2 + 5r + 25)$ g. $3(m + 3)(m^2 - 3m + 9)$

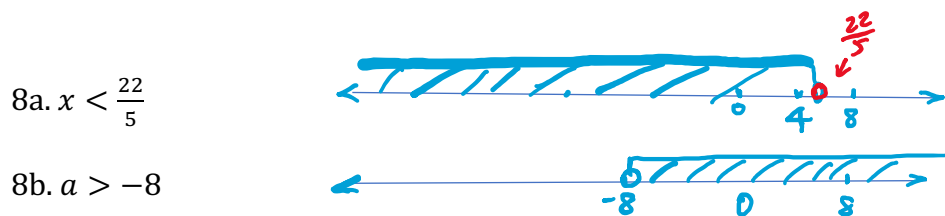
h. $(x^2 + 4y^2)(x + 2y)(x - 2y)$

5a. $13\sqrt{3}$ b. $\frac{\sqrt{10}}{5}$ c. $\frac{15+5\sqrt{7}+3\sqrt{2}+\sqrt{14}}{2}$

6a. $m = -\frac{35}{3}$ b. $x = -\frac{7}{3}$ c. all Real numbers d. $a = \frac{7 \pm i\sqrt{47}}{8}$ e. $p = 10, p = -2$

f. $x = 1, x = -4$ g. $m = \frac{5 \pm \sqrt{133}}{6}$

7. 11a. $x = -4, \frac{13}{2}$ b. $x = 1, 7$ c. no solution



9. a. $m > 1$ or $m < \frac{1}{3}$ b. $-1 \leq y \leq \frac{3}{2}$

10. a. $9 - 2i$ b. $-9 + 18i$ c. $6 - 10i$ d. $0 - 2i$

11. a. $34 - 42i$ b. $0 + 2i$ c. $\frac{1}{2} - \frac{3}{2}i$ d. $\frac{4}{13} + \frac{7}{13}i$ e. $\frac{8}{17} - \frac{15}{17}i$

12 a. $\frac{x+1}{2(x-3)}$ b. 5 c. $\frac{-3x-1}{3x}$ d. $\frac{7x+3}{(x+4)(x-1)}$ e. $\frac{-t^2-5t-2}{(t+2)(5t-1)(t+4)}$

f. $\frac{a^2-a-3}{(a-2)^2}$ g. $\frac{5(2x+3)}{3(20+x)}$ h. $\frac{5x+8}{3x+7}$ i. $\frac{2a}{a-2}$