Department of Mathematics, University of Wisconsin-Madison
Math 101 Test #3
Spring 2010

NAME: ________________________________

INSTRUCTOR: ________________________________

INSTRUCTIONS:

Time: 1 hour 15 minutes
You must show your work to receive credit.
Problems involving fractions/radicals should be solved using fractions/radicals not decimals. No calculator.

You might need the following formula:

The vertex of a quadratic function is \((\frac{-b}{2a}, \frac{4ac-b^2}{4a})\) or \((\frac{-b}{2a}, f(\frac{-b}{2a}))\)

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1. (15 points) Simplify as much as possible.

(a) $\sqrt[3]{-64}$

(b) $9^{\frac{3}{2}}$

(c) $-4^{\frac{3}{2}}$

(d) $-3\sqrt{72}$

(e) $(\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3})$
2. (24 points) Write the following expression in simplified form without negative exponents. Assume that all variables represent positive real numbers.

(a) \(\sqrt{49w^8}\)

(b) \(\sqrt[3]{16x^4y^6}\)

(c) \((\sqrt{x} + 3)^2\)

(d) \((\sqrt{3ab^2})(\sqrt{21a^2b})\)
(e) $2q\sqrt{48q^2} - \sqrt{27q^4}$

(f) $\frac{a^3 a^{-3}}{a^2} a$
3. (12 points) True or False. Circle the right answer.

(a) $\sqrt{2}$ and $3\sqrt{2}$ are like radicals.

True  False

(b) $(\sqrt{y} + \sqrt{x})^2 = y + x$

True  False

(c) $\sqrt[4]{x} = x^{\frac{1}{4}}$

True  False

(d) The graph of $Q(x) = x^2 + 3$ is the graph of $y = x^2$ shifted down 3 units.

True  False

(e) The function defined by $f(x) = 2(x - 1)^2$ has a minimum value but no maximum value.

True  False

(f) The quadratic equation $x^2 + x + 2 = 0$ has no real solution.

True  False
4. (8 points) Rationalize the denominator and simplify as much as possible.

\[
\frac{y - 2}{\sqrt{y} - \sqrt{2}}
\]
5. (16 points) Solve.

(a) $z = \sqrt{-7z + 18}$

(b) $\sqrt[3]{5a + 3} - \sqrt[3]{a - 13} = 0$
6. (16 points)

(a) Solve the following quadratic equation by completing the square.
\[ x^2 + 2x - 3 = 0 \]

(b) Solve the following quadratic equation by using the quadratic formula.

\[ 4x^2 = -4x - 1 \]
7. (9 points) For \( y = -x^2 - 2x + 3 \)

    (a) Find the vertex

    (b) Find the y-intercept

    (c) Find the x-intercept(s)

    (d) Use this information to graph the function.