DIRECTIONS: No calculators may be used. Be sure to **show ALL of your work**. Depending on the problem, you may receive **NO CREDIT** if no work is shown even if the answer is correct. <u>Circle</u> your answer. Once it has been graded and returned to you **keep this test** to study from for the final.

FUNCTION NOTATION: Use what you know of function notation to find the requested values.

1)   Given that $f(x) = x^2 - 2x - 6$ find:

a) the value of $f(-2)$

b) the value(s) of x if $f(x) = 2$

RADICALS: For each radical below, find the value if possible. If the radical yields a result that is "*irrational*" or that is "*not real*," then state that rather than giving a value.

2)   Follow the directions given in the box above for each of the following:

a) $\sqrt{169}$ _____

b) $-\sqrt{169}$ _____

c) $\sqrt{-169}$ _____

d) $\sqrt{22}$ _____

e) $\sqrt[3]{-64}$ _____

SIMPLIFYING EXPRESSIONS: Problems 3 through 11 all involve expressions that need to be simplified; some are rational expressions, and some are radical expressions. In each case simplify the expression as far as possible, making sure that your answers are in proper form.

3) $\sqrt{196x^{36}y^{16}}$

4) $\sqrt[3]{128}$

5) $\dfrac{7}{\sqrt[3]{9}}$

6) $4\sqrt{3x^4} + 10x\sqrt{75x^2}$

7) $(3+\sqrt{3})^2$

8) $\dfrac{2x}{x^2-4} - \dfrac{1}{x+2}$

9) $\dfrac{\sqrt{2}}{2+\sqrt{5}}$

10) $\dfrac{x + \dfrac{1}{x}}{\dfrac{x^2 + 1}{16}}$

11) $\dfrac{x^2 + 5x + 6}{4 - x^2} \div \dfrac{5x^2 + 30x + 45}{x^2 - 4x + 4}$

RATIONAL EXPONENTS: The two problems below involve rational exponents. Simplify each as far as possible.

12) $25^{\frac{1}{2}}$

13) $125^{-\frac{2}{3}}$

SOLVING EQUATIONS: Problems 14 through 18 all involve equations that need to be simplified; some involve rational expressions, and some involve radical expressions. In each case, find the value of x, and make sure you check to see that your answer is valid.

14) $\sqrt{2x + 7} = 5$

15) $3 + \sqrt{3 - x} = x$

16) $\dfrac{x}{4-x} = \dfrac{2}{x}$

17) $\dfrac{5}{4} + \dfrac{x-1}{4} = \dfrac{x}{2}$

18) $\dfrac{x}{3x+3} = \dfrac{2x-3}{x+1} - \dfrac{2x}{3x+3}$

APPLICATIONS: Solve the following application problems.

19)   The shortest side of a right triangle measures 5 cm. The lengths of the other two sides are consecutive integers. Find the lengths of the other two sides.

20)   With a riding lawn mower, Bob, can cut the lawn in a large park in 6 hours. With a small mower, his assistant Andrew needs 10 hours to cut the same lawn. If both Bob and Andrew work together on the lawn, how long will it take to cut it?