1.04 *The Other Calculator--Tool of the Trade*

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ANSWERS TO ALL EXERCISES ARE INCLUDED AT THE END OF THIS PAGE

At the time of this writing (2002), there are a variety of different calculators available at a variety of prices. If you are planning to take higher mathematics courses, or if you want to use a state of the art calculator, you may wish to get a **graphing calculator**. A graphing calculator is not necessary in this course, but it will certainly be handy to have one. An "ordinary" scientific calculator will be sufficient. For this course, several features will be necessary. **First,** you will need a **power function.** Look for the **[x^y]** or the **[y^x] function** on the calculator (on the TI-83/85/86, look for the **[^]** key). The opposite of **raising x or y to a power** is **taking a root of x or y** . This is the **root function**, which is indicated on the calculator by the keys $x^{\frac{1}{y}}$ *(or* $\sqrt[y]{x}$ *)* or $y^{\frac{1}{x}}$ *(or* $\sqrt[x]{y}$ *)* . For convenience, your calculator probably has the **square [x^2]** and **square root [$\sqrt{x}$] functions**.

Second, you will want the **scientific notation function.** This will probably be an **[EXP]** or an **[EE]** key on the calculator. **Third,** you will want a calculator with **parentheses [( ]** and **[ )]** keys. It will also be helpful to have **memory function(s)**, **reciprocal function [1/x]**, and a **fractions key [FRAC] or [a b/c]**. Most scientific calculators have all of these functions. **However, if you are buying a calculator, you should look for one that can convert from decimals to fractions and one that will convert decimal answers from standard decimal form to scientific notation and back.** These are very handy features, and not all scientific calculators have these functions. In this section, you will find some explanation, examples, and exercises which will supplement your calculator instructions and help you practice with your calculator. Remember that each brand and model of calculator is different, and it is important that you learn to work with <u>your</u> calculator, and that you <u>practice</u> with it!!!

Now that you have a calculator . . . What kind of calculator do you have? First, is it a graphing calculator, or non-graphing? Most calculators today have what are called **direct** as well as **indirect** functions (operations). The direct function is the one that is right on the key. This is accessed directly by just pressing the key. An indirect function is one that is directly above the key,

usually printed in a different color. Sometimes there are two indirect functions, usually in two different colors. To access the indirect functions, you first press the key in the upper left corner of the calculator, usually called **[2nd]**, sometimes **[shift]** or **[inv]**, then you press the key below the color-coded function you want to access. Sometimes there is a **[3rd]** function in another color, with additional functions color-coded to it. With graphing calculators, there are also special **Function** keys and also **Menu** keys.

PRINCIPLE

You must practice with and become familiar with your own calculator. During an exam is not a good time to do this!

PRINCIPLE

When learning a new skill always begin with examples for which you already know the answer.

POWERS AND ROOTS

To begin using the calculator, try raising a number to a power. You may have an [x^2] key. If so, this is the easiest way to square a number. When raising to other powers, you must use y^x *or* x^y (for TI-85 or TI-86, look for the **[^]** on the right side of the calculator.)

EXAMPLE 1. 7^2 Press the keys [7] [x^2] [=] or [Enter] (Answer is 49).
Alternate method: Press the keys [7] [y^x or ^] [2] [= or Enter].

EXAMPLE 2. 2^3 Press the keys [2] [y^x or ^] [3] [= or Enter].
The answer, of course, is 8.

EXAMPLE 3. 14^5 Press the keys [14] [y^x or ^] [5] [= or Enter].
The answer (of course?) is 537824.

The opposite (or inverse) operation of **squaring** is the operation of **square root.** The opposite (inverse) of **cubing** is **cube root.** The opposite(inverse) of **raising a number to a power** is **taking a root of a number.** As examples, consider:

$7^2 = 49$. The opposite operation is $\sqrt{49} = 7$. (See Example 1.)

$2^3 = 8$. The opposite operation is $\sqrt[3]{8} = 2$. (See Example 2.)

$14^5 = 537824$. The opposite operation is $\sqrt[5]{537824} = 14$. (See Example 3.)

At this point, a very important question should be answered about your calculator relating to the order in which you must enter the numbers. The question is this: when you calculate the √9, do you enter [9] first and then [√]? Or do you enter [√] first and then the [9]? This question is important, and knowing which way your calculator operates will save you much time and trouble in later calculations! Use your calculator to do this both ways to see which way gives you the correct answer of [3]. You need to make note of whether you enter the base number or the operation first. To help you remember and for notation purposes, throughout this book, we define "TYPE I" and "TYPE II" calculators:

TYPE I CALCULATOR: √9 : **[9] [√]** **Answer is 3.**

TYPE II CALCULATOR: √9 : **[√] [9] [Enter]** **Answer is 3.**

Now that you have determined the type of calculator you have, try to calculate $\sqrt[3]{125}$ (you already know the answer is 5, right?) First, some calculators have a special cube root key (probably it says [$\sqrt[3]{x}$]). If so, then

TYPE I CALCULATOR: $\sqrt[3]{125}$: [125] [$\sqrt[3]{x}$] **Answer is 5.**

TYPE II CALCULATOR: $\sqrt[3]{125}$: [$\sqrt[3]{x}$] [125] [Enter] **Answer is 5.**

If you do not have a special cube root key, then look for a key labeled $\sqrt[x]{y}$, $\sqrt[y]{x}$, $x^{\frac{1}{y}}$, or $y^{\frac{1}{x}}$, whichever your calculator has. This key will be necessary even if you have the special cube root key, when you need to find fourth roots, fifth roots, etc. Notice that this is probably a **second function,** so begin at the upper left key on the calculator:

TYPE I $\sqrt[3]{125}$: [125] [2nd] [$\sqrt[x]{y}$] [3] [=] or [Enter]. (Answer is 5.)

TYPE II $\sqrt[3]{125}$: [3] [2nd] [$\sqrt[x]{y}$] [125] [=] or [Enter]. (Answer is 5.)

TI-85/86: [3] [2nd] [MATH] [F5(MISC)] [MORE] [F4 ($\sqrt[x]{}$)] [125] [Enter].

NOTE: If you have $\sqrt[x]{}$ in your CUSTOM menu, then do this:

[3] [CUSTOM] [$\sqrt[x]{}$] [125] [Enter].

EXERCISES: Use your calculator to compute the following exercises (in real life, not everything comes out even--round to nearest hundredth).

1. 5^2	2. 9^2	3. 12^2	4. 13^2
5. 25^2	6. 56^2	7. 101^2	8. 1001^2
9. 11^2	10. 111^2	11. 1111^2	12. 11111^2
13. 2^3	14. 3^3	15. 4^3	16. 5^3
17. 7^3	18. 12^3	19. 13^6	20. 3^{12}

21. $\sqrt{49}$ 22. $\sqrt{144}$ 23. $\sqrt{1600}$ 24. $\sqrt{1681}$

25. $\sqrt{1024}$ 26. $\sqrt{169}$ 27. $\sqrt{102400}$ 28. $\sqrt{231361}$

29. $\sqrt{203401}$ 30. $\sqrt{915849}$ 31. $\sqrt{123454321}$ 32. $\sqrt{1522756}$

33. $\sqrt{750}$ 34. $\sqrt{1352}$ 35. $\sqrt{123456789}$ 36. $\sqrt{987654321}$

37. $\sqrt[3]{64}$ 38. $\sqrt[3]{216}$ 39. $\sqrt[3]{1728}$ 40. $\sqrt[3]{1,000,000}$

EXTRA CHALLENGE:

41. $\sqrt[3]{4913}$ 42. $\sqrt[3]{300763}$ 43. $\sqrt[4]{16}$ 44. $\sqrt[4]{81}$

45. $\sqrt[5]{32}$ 46. $\sqrt[5]{1024}$ 47. $\sqrt[12]{531441}$ 48. $\sqrt[12]{4096}$

ANSWERS 1.04

p. 24 - 26: **1.** 25; **2.** 81; **3.** 144; **4.** 169; **5.** 625; **6.** 3136; **7.** 10201; **8.** 1002001; **9.** 121; **10.** 12321; **11.** 1234321; **12.** 123454321; **13.** 8; **14.** 27; **15.** 64; **16.** 125; **17.** 343; **18.** 1728; **19.** 4826809; **20.** 531441; **21.** 7; **22.** 12; **23.** 40; **24.** 41; **25.** 32; **26.** 13; **27.** 320; **28.** 481; **29.** 451; **30.** 957; **31.** 11111; **32.** 1234; **33.** 27.39; **34.** 36.77; **35.** 11111.11; **36.** 31426.97; **37.** 4; **38.** 6; **39.** 12; **40.** 100; **41.** 17; **42.** 67; **43.** 2; **44.** 3; **45.** 2; **46.** 4; **47.** 3; **48.** 2; **49.** 10; **50.** 2; **51.** 6; **52.** 9; **53.** 20; **54.** 0.4; **55.** 3.6; **56.** (Nearest hundredth) 451.89.