Example 8 **Finding z_α**

In the expression z_α, let $\alpha = 0.025$ and find the value of $z_{0.025}$.

Solution

The notation of $z_{0.025}$ is used to represent the z score with an area of 0.025 to its right. Refer to Figure 6-10 and note that the value of $z = 1.96$ has an area of 0.025 to its right, so $z_{0.025} = 1.96$.

CAUTION When using Table A-2 for finding a value of z_α for a particular value of α, note that α is the area to the *right* of z_α, but Table A-2 lists cumulative areas to the *left* of a given z score. To find the value of z_α by using the table, resolve that conflict by using the value of $1 - \alpha$. In Example 8, the value of $z_{0.025}$ can be found by locating the area of 0.9750 in the body of the table.

Examples 3 through 7 in this section are based on the real application of the bone density test, with scores that are normally distributed with a mean of 0 and standard deviation of 1, so that these scores have a standard normal distribution. Apart from the bone density test scores, it is rare to find such convenient parameters, because typical normal distributions involve means different from 0 and standard deviations different from 1. In the next section we present methods for working with such normal distributions.

using TECHNOLOGY

When working with the standard normal distribution, a technology can be used to find z scores or areas instead of Table A-2. The following instructions describe how to find such z scores or areas with technology.

STATDISK Select **Analysis, Probability Distributions, Normal Distribution.** Either enter the z score to find corresponding areas, or enter the cumulative area from the left to find the z score. After entering a value, click on the **Evaluate** button. See the STATDISK display included with Example 4.

MINITAB

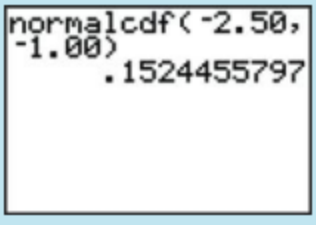
- To find the cumulative area to the left of a z score (as in Table A-2), select **Calc, Probability Distributions, Normal, Cumulative probabilities.** Then enter the mean of 0 and standard deviation of 1. Click on the **Input Constant** button and enter the z score.
- To find a z score corresponding to a known probability, select **Calc, Probability Distributions, Normal.** Then select **Inverse cumulative probabilities** and the option **Input constant.** For the input constant, enter the total area to the left of the given value.

EXCEL

- To find the cumulative area to the left of a z score (as in Table A-2), click on ***fx***, then select **Statistical, NORMSDIST** (or **NORMS.DIST**). Enter the z score.
- To find a z score corresponding to a known probability, select ***fx*, Statistical, NORMSINV** (or **NORMS.INV**). Enter the total area to the left of the given value.

TI-83/84 PLUS Unlike most other technologies, the TI-83/84 Plus calculator does not base areas on cumulative regions from the left. Instead, the areas correspond to the z score that is a left boundary and another z score that is a right boundary. Press 2ND VARS and select **normalcdf.** Proceed to enter the two z scores separated by a comma, as in (left z score, right z score). Example 5 could be solved with the command of **normalcdf(−2.50, −1.00),** which yields a probability of 0.1524 (rounded) as shown in the accompanying screen.

TI-83/84 PLUS



To find a z score corresponding to a known probability, press 2ND VARS and select **invNorm.** Proceed to enter the total area to the left of the z score. For example, the command of **invNorm(0.975)** yields a z score of 1.959963986, which is rounded to 1.96, as in Example 8.

STATCRUNCH Click on **Open StatCrunch,** then click on **Stat.** Select **Calculators,** then select **Normal.** You can either enter a probability or a value of x. Click on **Compute.**