

When using the TI-83 Plus or TI-84 Plus calculators you access **Finance** by pressing the APPS key.

Return on a Share of Stock

The return on a share of stock is the internal rate of return of the cashflows associated with the stock purchase, dividends, and sale.

Example 1:

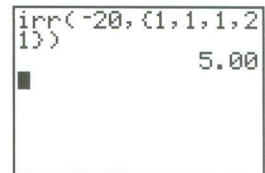
Four years ago, John purchased Alpha Beta Company shares at \$20 and sold them today at the same price. Each year he received a dividend of \$1. What was his return on the investment?

Calculator Housekeeping Detail:

The **irr**(function calculates the interest rate at which the net present value of the cashflows is equal to zero. The syntax is **irr**(initial cashflow, cashflow list[,frequency list]).

1. From the Home Screen, press the **2nd** [FINANCE] (5A)† key and choose **8:irr**(from the CALC menu.
2. For this problem the initial cashflow is -20. The cashflow list is {1,1,1,21}, indicating the \$1 dividend for the first three years and the dividend (\$1) plus the cash from the sale (\$20) in the fourth year. Since the cashflows are listed individually, no frequency list is required. (Figure 1)

(Figure 1)



The result of 5% was, of course, not unexpected given the dividend rate.

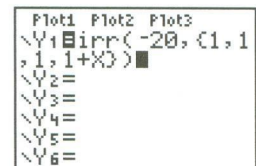
Note: The frequency list option would allow **irr**(-20,{1,1,1,21}) to be replaced by **irr**(-20, {1,21},{3,1}) since the \$1 payment occurred three times and the \$21 payment occurred once.

Table and Graph Exploration

An exploration can be carried out by varying the selling price of the stock and examining the impact on the rate of return. This exploration can be done either graphically or with a table. To do this, replace the sale price with X in the **irr** calculation and graph the result.

1. Press the **Y=** key (1A), and clear all functions.
2. Input **irr(-20, {1,1,1,1+X})** for Y₁. X is the stock selling price and 1 + X is the last year's cash flow, a \$1 dividend and \$X for the stock. (Figure 2)

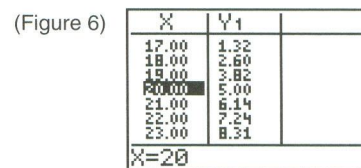
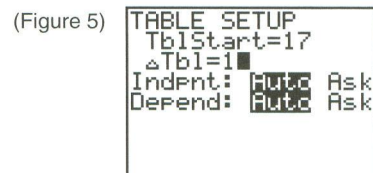
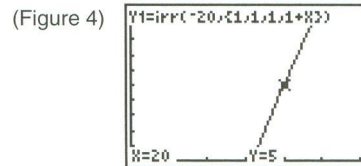
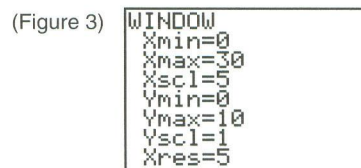
(Figure 2)



Thus, for each stock sale price X, Y will be the internal rate of return for the purchase, dividends and selling price.

† Refer to the section on Key Arrangement in Chapter 1 for an explanation of the key locator codes used in this manual.

- Press the **WINDOW** key (1B). Set the window screen to [0,30] by [0,10] by making Xmin = 0, Xmax = 30, Ymin = 0, Ymax = 10. (Figure 3)
- Press the **GRAPH** key (1E). The graph will take several minutes to complete because the **irr**(function must be calculated for each value of X. To speed up the graphing, change Xres to 5 on the window screen.
- Press the **TRACE** key (1D). Use the arrow keys to move the cursor along the curve.
- Type in a specific X value (for example, 20), and press **ENTER**. The Y value will appear on the screen. (Figure 4)
- For the tabular exploration, press **2nd** [TBLSET] (1B). Use 17 as the TblStart value and increment by 1. (Figure 5)



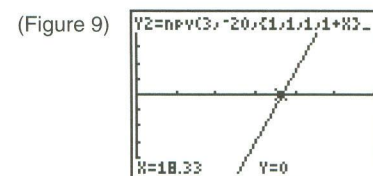
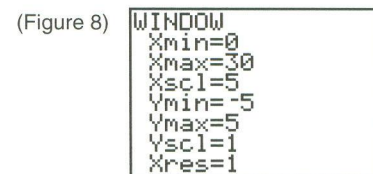
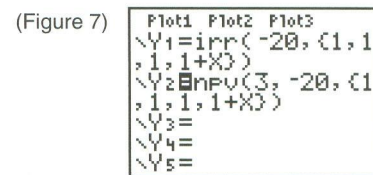
- Press the **2nd** [TABLE] (1E). Use the arrow keys to move down the table of values. (Figure 6)

Note: The difference between successive Y values is not constant. This indicates that the **irr**(function is not linear, even though the short segment graphed in Figure 4 appears to be linear.

Example 2:

Jim is worried about the purchasing power of his investment. If the average rate of inflation is 3%, what is the lowest price at which the stock in the previous example can be sold and still breakeven?

- Press the **Y=** key (1A).
- Turn Y₁ off by moving the cursor to the equal sign of Y₁ and press **ENTER**. (If a function is on, it will be turned off; if it is off, pressing **ENTER** will turn the function on.)
- In Y₂, enter **npv(3, -20, {1,1,1,1+X})** so that Y₂ is the net present value of the transaction for each stock selling at the price of X. (Figure 7)
- Press the **WINDOW** key (1B). Set the window screen to [0,30] by [-5,5] by making Xmin = 0, Xmax = 30, Ymin = -5, Ymax = 5. (Figure 8)



- Press the **GRAPH** key (1E).
- Press the **TRACE** key (1D). Use the arrow keys to move the cursor along the curve.
- Type in a specific X value (for example, 18.33), and press **ENTER**. The Y value will appear on the screen. (Figure 9)

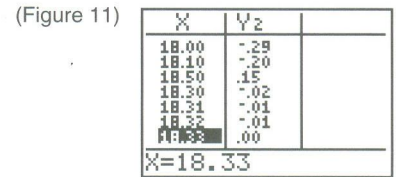
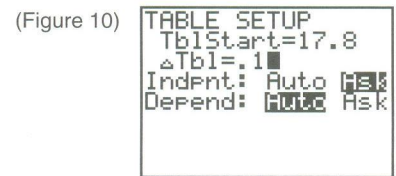
When Y = 0, X is the breakeven price for the stock.

- For a tabular exploration, press the $\boxed{2\text{nd}}$ [TBLSET] (1B). Use 17.8 as the TblStart value and increment by .1.

The table exploration can be changed to allow the entry of stock prices manually.

- Move the cursor to **Ask** and press the $\boxed{\text{ENTER}}$ key. (Figure 10)
- Press $\boxed{2\text{nd}}$ [TABLE] (1E). Note that the independent value is the stock price.
- Type in values for X. (Figure 11)

Note: The Y_1 values do not show in the table because Y_1 was turned off.



A more realistic example would show dividend payments changing.

Example 3:

Assume that stock is purchased for \$19 per share and dividend payments received annually were \$1, \$1.06, and \$1.10. The stock was sold for \$22.50. What was the rate of return on the investment?

Year 0	Year 1	Year 2	Year 3
	\$1.00	\$1.06	\$22.50 \$ 1.10 } \$23.60
-19			

- Press $\boxed{2\text{nd}}$ [QUIT] (2B) to return to the Home Screen.
- Press $\boxed{2\text{nd}}$ [FINANCE] (5A) and choose **8:irr(** from the CALC menu.
- Enter the values as shown.

The internal rate of return is 11.04%. (Figure 12)

