

Compounding Interest Continuously

$$y = Pe^{rt}$$

Diagram illustrating the components of the continuous compounding formula $y = Pe^{rt}$:

- y : Amount after t years
- P : Principal
- e : Annual Interest rate as a decimal
- t : # years

You won \$100,000 and plan to invest it in an account that pays 4% interest compounded continuously.

How much will you have in 30 years?

$$y = Pe^{rt}$$

$$100,000 e^{.04 \times 30} = \$332,011.69$$

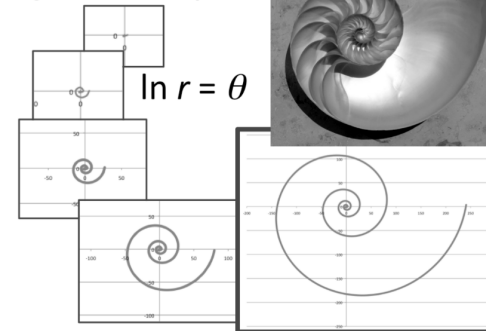
Log_e is called a Natural Logarithm

and is written as LN or Ln or ln

$$\text{Log}_e 7.5 = 0.06x$$

$$\ln 7.5 = 0.06x$$

logarithmic spiral



This is one reason why ln is called a "Natural Logarithm"

You won \$100,000 and plan to invest it in an account that pays 4% interest compounded continuously.

$$y = Pe^{rt}$$

How many years will it take for this investment to reach \$1,000,000? Round to the nearest hundredth.

$$\frac{1,000,000}{100,000} = \frac{100,000}{100,000} e^{.04t}$$

$$10 = e^{.04t}$$

$$\frac{\ln 10}{.04} = \frac{.04t}{.04}$$

$$X = 57.56$$

Write in logarithmic form.

$$5^x = 80$$

$$\log_5 80 = x$$

$$10^x = 137$$

$$\log 137 = x$$

$$e^x = 40$$

$$\ln 40 = x$$

Write in exponential form:

$$\log_x 12 = 3$$

$$x^3 = 12$$

$$\log 7 = x$$

$$10^x = 7$$

$$\ln x = 44$$

$$e^{44} = x$$

Solve each equation. Round to the nearest hundredth.

$$1. \ln(3x - 1) = 5$$

$$e^5 = 3x - 1$$

$$x = \frac{e^5 + 1}{3} = 49.80$$

$$2. \ln 5x^2 = 8$$

$$e^8 = 5x^2$$

$$\sqrt{\frac{e^8}{5}} = \sqrt{x^2}$$

$$x = \pm 24.42$$

$$3. 2e^{x+1} - 3 = 14$$

$$+3 \quad +3$$

$$\frac{2e^{x+1}}{2} = \frac{17}{2}$$

$$e^{x+1} = 8.5$$

$$\ln 8.5 = x+1 \rightarrow x = 1.14$$

You can now finish Hwk #26.

Sec 8-6

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Problems 14, 16, 19, 24-26