

Provide clear explanations. Follow the Honor Code. Round answers to the nearest hundredth.

- (3) 1. A company has fixed costs of \$10,000 each month and it costs \$50 to produce each widget.
a) Write the total cost C as a function of the number of widgets x produced in a month.
b) What will it cost to produce 300 widgets?
c) How many widgets can be produced for \$50,000?

a) $C(x) = 10,000 + 50x$

b) $C(300) = 10,000 + 50 \cdot 300 = \boxed{25,000}$

c) $50,000 = 10,000 + 50x$

$40,000 = 50x$

$\boxed{800 = x}$

- (4) 2. $2x - 7y = -2$; $3x + 4y = 12$
a) Sketch the graphs of the equations.
b) Use the graphs to estimate the solution.
c) Solve the system.

a) intercepts are: $(0, \frac{2}{7})$, $(-\frac{1}{3}, 0)$; $(0, 3)$, $(4, 0)$

b) about $(2.6, 1.1)$

$3x + 4 \cdot \frac{30}{29} = 12$

c) $6x - 21y = -6$

$6x + 8y = 24$

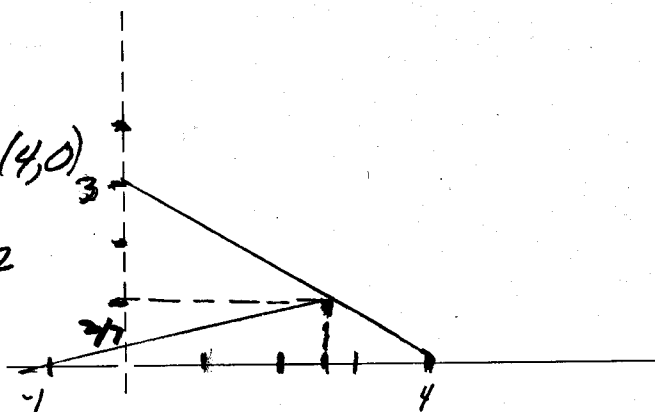
$3x = 12 - \frac{120}{29}$

$29y = 30$

$x = \frac{228}{3 \cdot 29}$

$y = \frac{30}{29}$

$x = \frac{76}{29}$

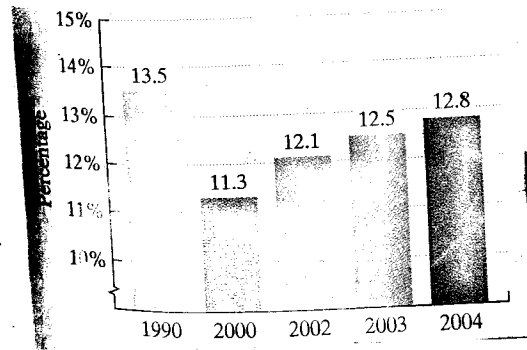


CHECK

$2(\frac{76}{29}) - 7(\frac{30}{29}) = \frac{-58}{29} = -2$

- (2) 3. Would the data in this bar graph be best modeled by a linear, exponential, logarithmic, or quadratic function? Explain.

quadratic because the graph looks most like a parabola, i.e. decreases and then increases



- (2) 4. A book has been marked down by 15% to \$22.91. What was the starting price?

$r = -.15$

$F = (1+r)S$

$F = 22.91$

$22.91 = (1-.15)S = .85S$

$S = ?$

$S = 22.91 / .85 = \boxed{26.95}$

$$(4) A = PMT \left[\frac{(1 + r/n)^{nt} - 1}{r/n} \right]$$

5. Solve for x: 20

a) $10,000 = 5000(x)^{20}$; b) $300,000 = x \left[\frac{(1 + .06/12)^{240} - 1}{.06/12} \right]$

a) $x^{20} = 10,000/50,000 = 2$

So $x = 2^{1/20} = 1.04$

OR $20 \log x = \log 2$

$\log x = \log 2 / 20 = .01505$

$x = 10^{.01505} = \boxed{1.04}$

CHECK

$5000(1.04^{20}) = 10,956$

↑
round off error

b) $.005 \cdot 300,000 = x [(1.005^{240} - 1)]$

$1500 = x [2.3102]$

$x = 1500 / 2.3102 = 649.29$

$= \boxed{649.29}$

CHECK $649.29 \left[\frac{1.005^{240} - 1}{.005} \right]$

$\left(\frac{.06}{12} \right)$

$= 299,998.53$

(4) 6. Write an equation which solves each of the following. Do NOT solve.

a) How much must you invest each month at 6% compounded monthly in order to accumulate \$300,000 in 20 years?

b) What rate must you get, compounded quarterly, in order for a \$5000 deposit to be worth \$10,000 in 5 years?

a) $A = 300,000$

$r = .06$

$n = 12$

$t = 20$

$PMT = ?$

$300,000 = PMT \left[\frac{(1 + .06/12)^{240} - 1}{.06/12} \right]$

by 5b) $PMT = 649.29$

b) $P = 5000; A = 10,000$

$n = 4; t = 5; r = ?$

$10,000 = 5000 \left[1 + r/4 \right]^20$

by 5a) $1 + \frac{r}{4} = 1.04$

So $r = .16$

(1) 7. What is the log of 10^{200} ?

$\log(10^{200}) = \boxed{200}$ because \log_x and 10^x are inverses

(2) 8. If 1% of a chemical decays each year, how long will it take for all of it to decay?

If P is initial amount and A is amount after t years, then $A = (1 - .01)^t P = (.99)^t P$ is $\boxed{\text{never}} 0$.

Every year you have 99% of what you had last year.