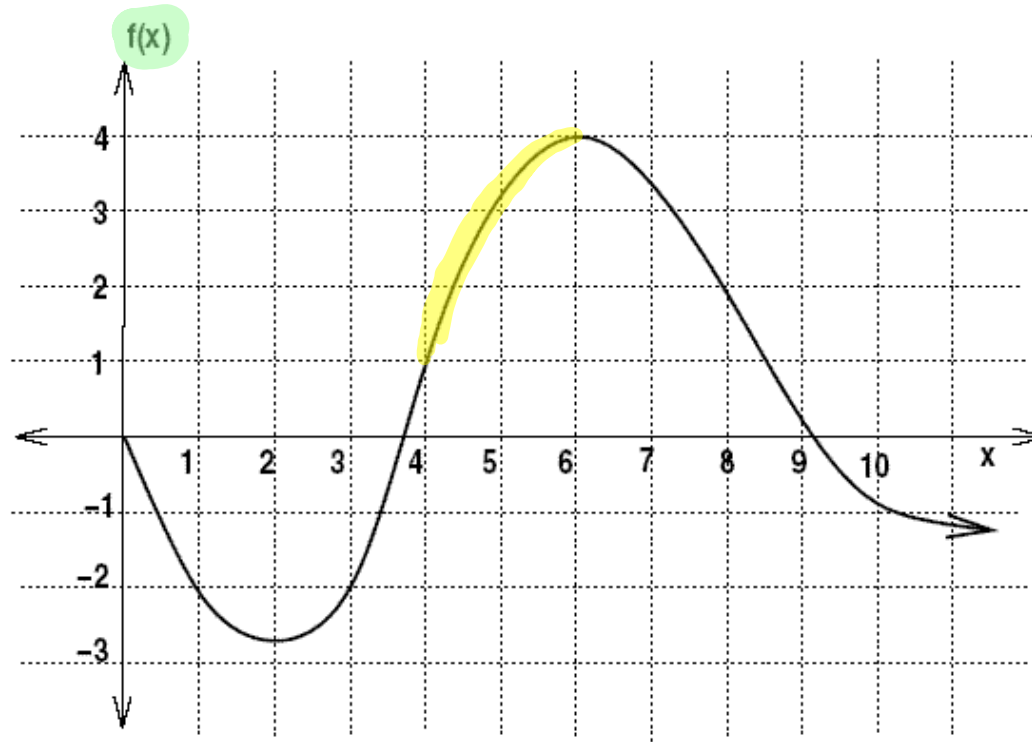


Week in Review # 2
Section 1.3 and 1.5



1. The graph of f is given to the right.

(a) Find the intervals(x-intervals) where f is decreasing and concave up.

$$0 < x < 2$$
$$x > 8$$

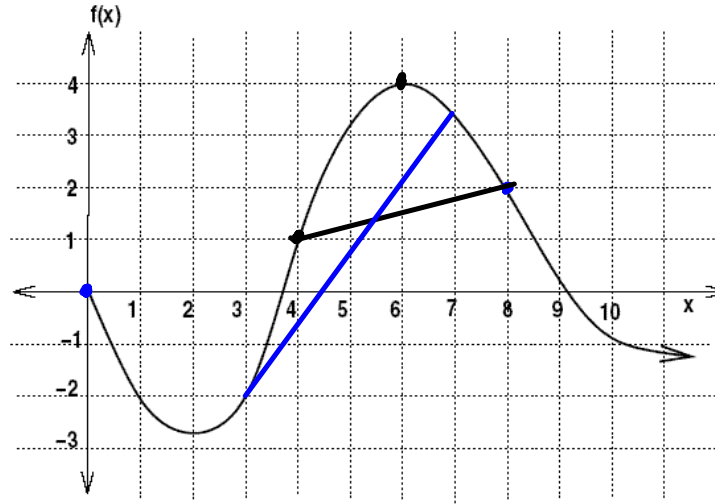
(b) Find the intervals(x-intervals) where f is increasing and concave down.

$$4 < x < 6$$

Week in Review # 2
Section 1.3 and 1.5

$$\star \frac{f(6) - f(4)}{6 - 4} =$$

$$\frac{4 - 1}{6 - 4} = \frac{3}{2}$$



- (c) On which interval $4 \leq x \leq 6$ or $0 \leq x \leq 8$ is the average rate of change the largest?

$$4 \leq x \leq 6$$

$$\frac{f(8) - f(0)}{8 - 0} = \frac{2 - 0}{8 - 0} = \frac{1}{4}$$

- (d) Which of these is the largest?

$$\frac{f(8) - f(4)}{8 - 4} \text{ or } \frac{f(7) - f(3)}{7 - 3}$$

← just slopes. (with is bigger)

$$f(8) = 2$$

$$f(4) = 1$$

$$\frac{2 - 1}{8 - 4} = \frac{1}{4}$$

$$f(7) \approx 3.4$$

$$f(3) = -2$$

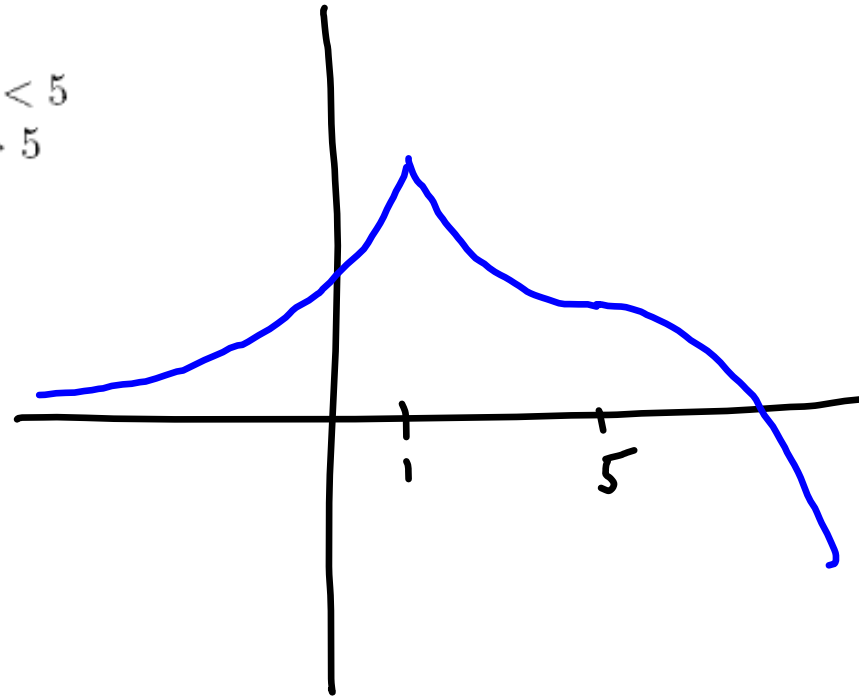
$$\frac{3.4 - (-2)}{7 - 3} = \frac{5.4}{4}$$

2. Sketch a graph that is

increasing and concave up for $x < 1$

decreasing and concave up for $1 < x < 5$

decreasing and concave down for $x > 5$



$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

3. Compute the average rate of change for $f(x) = 5x - 2x^2 + 7$ from $x = 1$ to $x = 4$

$$\frac{f(4) - f(1)}{4 - 1} = \frac{-5 - 10}{3} = \frac{-15}{3} = -5$$

$$m = \frac{\Delta y}{\Delta x}$$

$$\frac{\Delta B}{\Delta t} \frac{\$}{\text{yr}}$$

4. The figure gives the balance, in dollars, of a bank account t years after it has been started.

- (a) Compute and interpret the average rate of change from $t = 0$ to $t = 2$.

$$\begin{aligned} \frac{B(2) - B(0)}{2 - 0} &= \frac{2000 - 1500}{2 - 0} \\ &= \frac{500}{2} = \$250/\text{yr} \end{aligned}$$

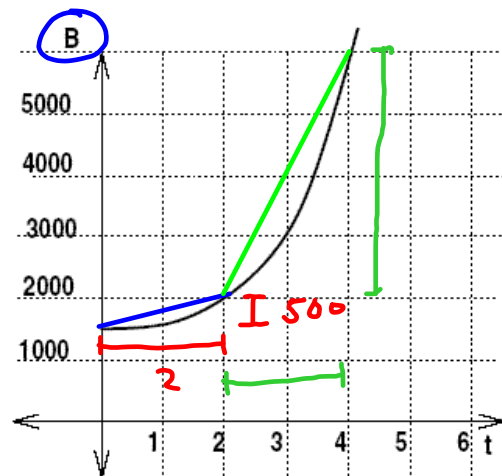
for the first 2 yrs the balance of the account grew on average by \$250 each yr.

- (b) Compute and interpret the average rate of change from $t = 2$ to $t = 4$.

$$\frac{4000}{2} = \$2000/\text{yr}$$

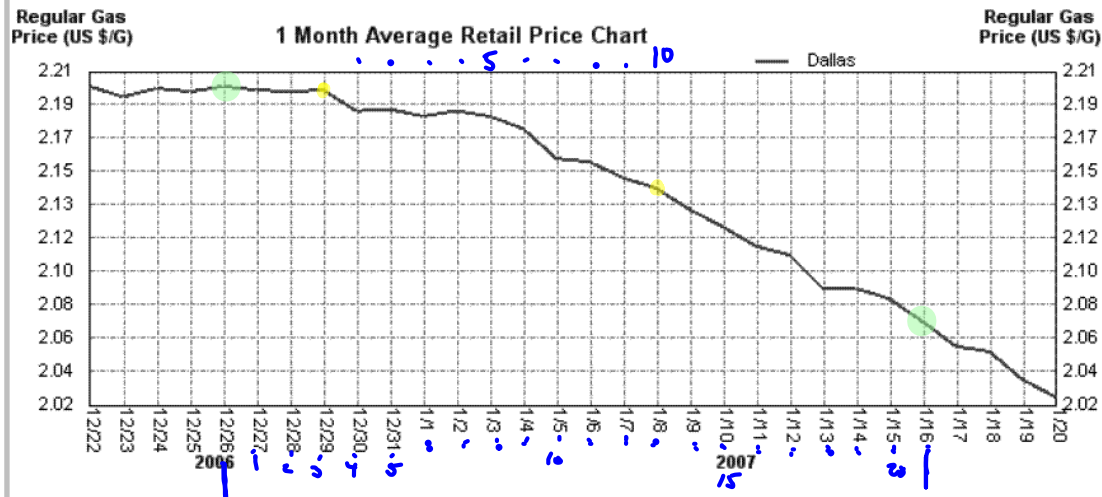
for the 3rd & 4th years (ie from $t = 2$ to $t = 4$) the balance grew on avg by \$2000 each year.

- (c) Graphically represent your answers for part (a) and (b)



$$\begin{aligned} \frac{f(4) - f(2)}{4 - 2} &= \frac{6000 - 2000}{2} \\ &= \$2000/\text{yr} \end{aligned}$$

5. The following graph shows the daily average retail price of regular gasoline in the Dallas area.



- (a) What is the average rate of change of gas prices from December 26 to January 16? Interpret this answer.

$$\frac{\Delta p}{\Delta t} = \frac{2.07 - 2.20}{21} = \$-0.006190 / \text{day}$$

on average the price per gallon of gas is dropping by \$0.006190 each day from Dec 26 to Jan 16.

- (b) What is the average rate of change of gas prices from December 29 to January 8? Interpret this answer.

$$\frac{2.14 - 2.20}{10} = \$-0.006$$

The price per gallon of gas is dropping by \$0.006 each day from Dec. 29 to Jan 8.

6. For these exponential formulas give the initial value and the relative growth/decay rate (percent rate of change).

(a) $y = 37(.87)^x$

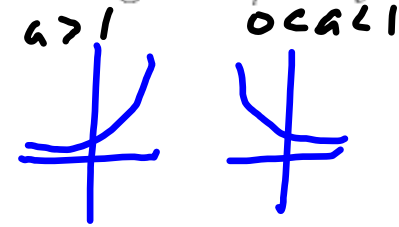
initial = 37

$a = .87$

$1+r = .87$

$r = -.13$

relative decay rate = 13%



$y = P_0 a^x$

$a = 1+r$

(b) $y = 100(1.034)^x$

initial = 100

$a = 1.034$

$1+r = 1.034$

$r = .034$

rel. rate of growth = 3.4%

7. Find the exponential formula for the data sets.

(a)	x	2	5
	y	50	6.25

$$y = 200(.5)^x$$

$$50 = P_0 a^2$$

$$\frac{50}{a^2} = P_0$$

$$200 = P_0$$

$$y = P_0 a^x$$

$$6.25 = P_0 a^5$$

$$6.25 = \frac{50}{a^2} a^5$$

$$6.25 = 50 a^3$$

$$\frac{6.25}{50} = a^3$$

$$.125 = a^3$$

$$a = (.125)^{1/3} = .5$$

(b)	x	3	5
	y	1728	2488.32

$$y = 1000(1.2)^x$$

done
by exp. key.

8. Give a possible formula for these statements.

$$a = 1 + r$$

(a) The city's population increased by 12% each year.

$$y = P_0 (1.12)^x$$

↑ initial size

x is years

(b) The city's population increased by 200,000 each year.

$$y = mx + b$$

$$y = 200000x + P_0$$

↑ initial when $x=0$.

(c) A person is given a dose of a drug and the drug disappears (used by the body) by 4% per minute.

$$y = P_0 (.96)^x$$

x in minutes

$$1 + r \quad r = -.04$$

(d) The lollipops at a pediatrician office are decreasing at a rate of 135 per day.

$$y = mx + b$$

$$y = -135x + P_0$$

↑ initial amt.

9. You are told that the function $f(x)$ is an exponential function and that $f(2) = 300$. If the function has an average rate of change of 600 from $x = 2$ to $x = 5$, find an exponential formula for this function.

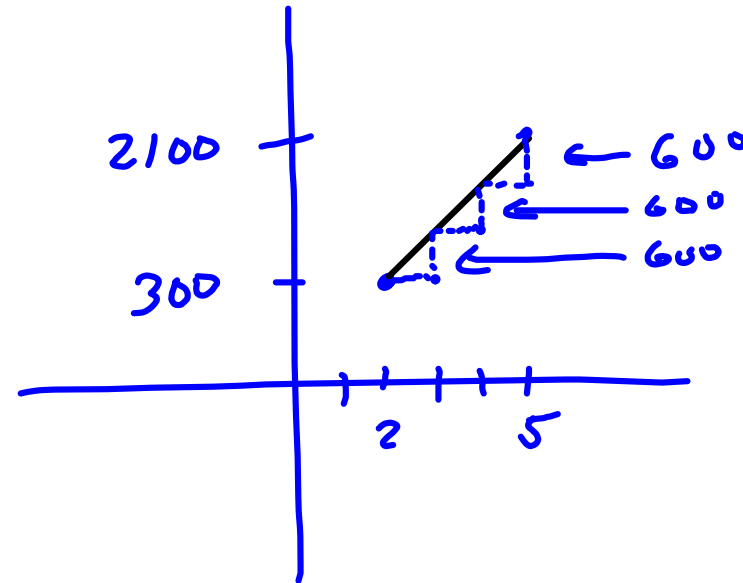
Avg. Rt. of change

$$\frac{f(5) - f(2)}{5 - 2} = 600$$

$$\frac{f(5) - 300}{3} = 600$$

$$f(5) - 300 = (600)3$$

$$\begin{aligned} f(5) &= (600)3 + 300 \\ &= 2100 \end{aligned}$$



x	2	5
y	300	2100

exp. Reg ↗

$$y = 81.98276 (1.912931153)^x$$

10. A patient is given a 75mg dose of a drug. This drug leaves the body at a rate of 8.25% per hour.

(a) How much of the drug is in the body after 3 hours?

$$y = 75(1 - 0.0825)^x = 75(.9175)^x$$

plug in 3 for x

57.92679 mg

(b) How much of the drug is in the body after 12 hours?

plug in 12 for x

26.68911 mg

11. A pesticide has a half life of 7 days. A crop is sprayed with this pesticide.

(a) Find the percentage of the chemical still on the plants after 3 days.

$(0, 100)$
 $(7, 50)$
exp. Reg.

$$y = 100 \left(\underline{.90572366} \right)^x$$

plug in 3 for x

74.2997%

(b) The FDA will not approve a pesticide for use on commercial crops if that pesticide has a relative rate of decay that is less than 12% per day. Is this pesticide approved for use on commercial crops by the FDA? justify your answer.

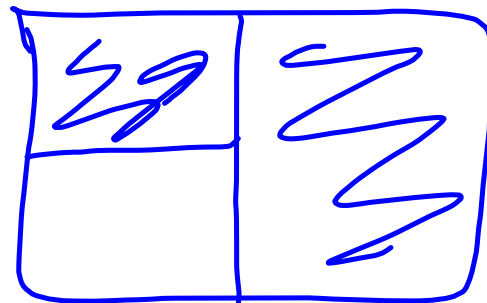
$$1+r = .90572366$$

$$r = -.09427634$$

rate of decay is 9.427634%

So
no

(c) How long will it take until less than 25% of the pesticide is still on the plants?



after 14 days.