Good afternoon; no warm up. We will assess after a few notes

***new policy**
If you wish, you can use your formula booklets
and notes on a reassessment but your maximum
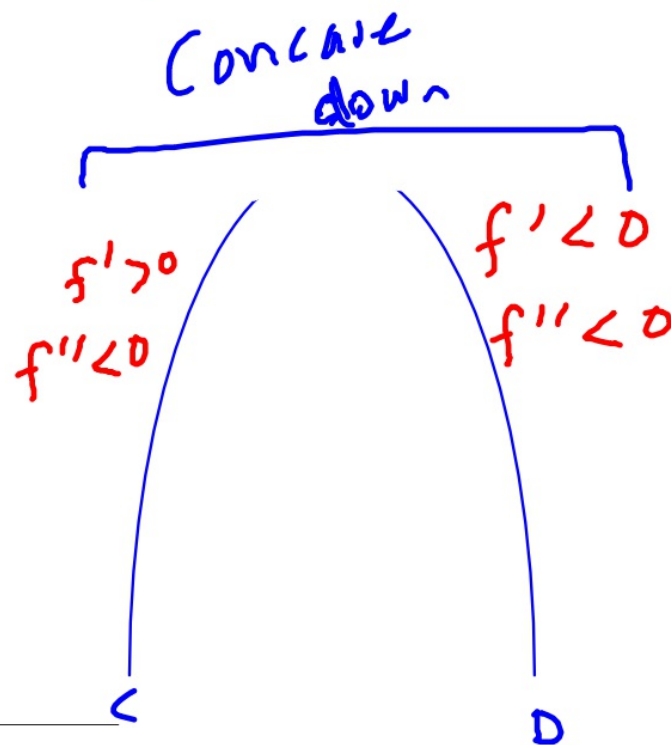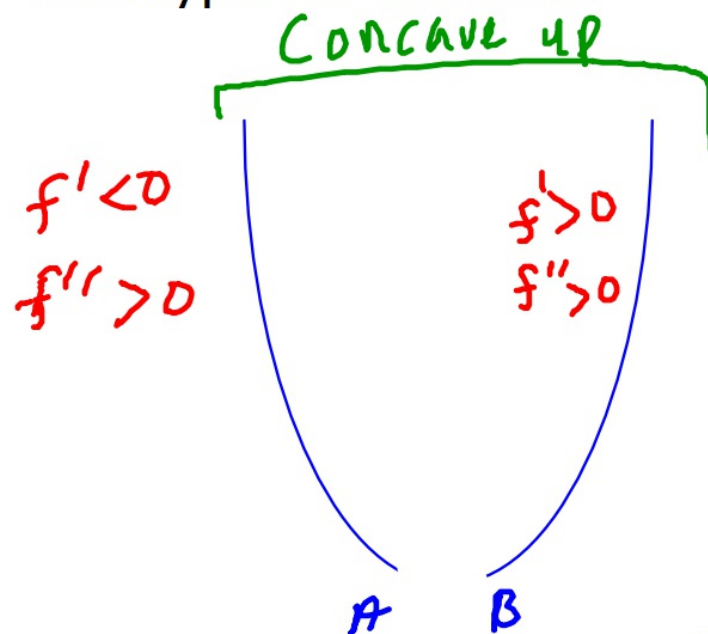grade will be capped to a 3.

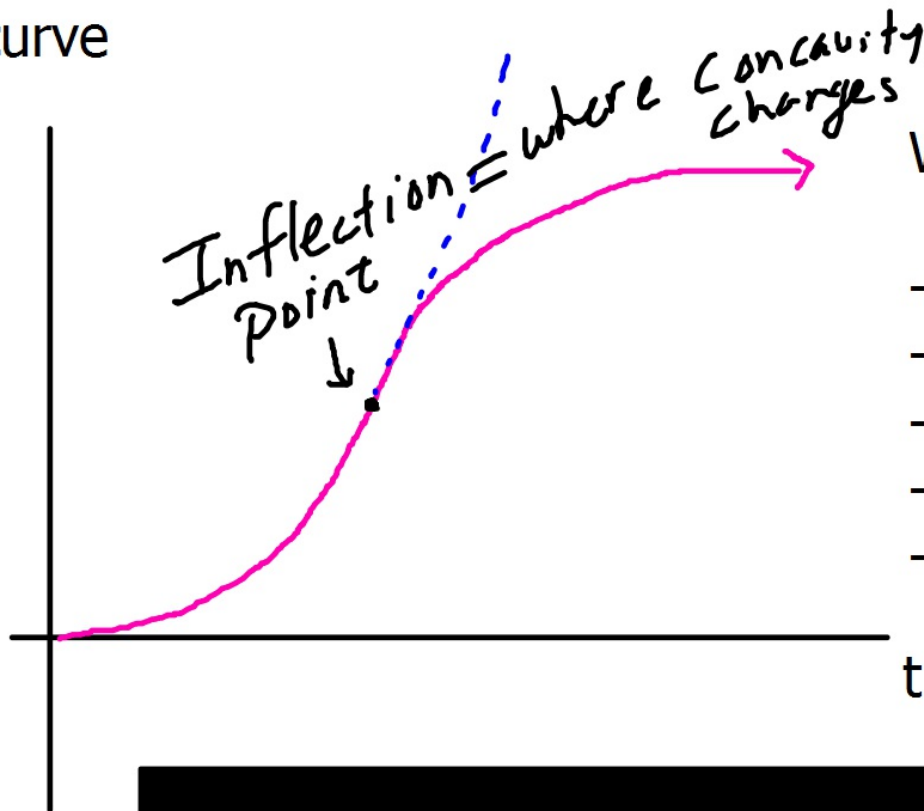I must initial your retake to indicate approval

Reminders:
- q2 ends a week from tmrw
- reassess in any DS
   (Tuesday is not good)
- can stay after school
next week most days

Concavity and the Second Derivative [notes]
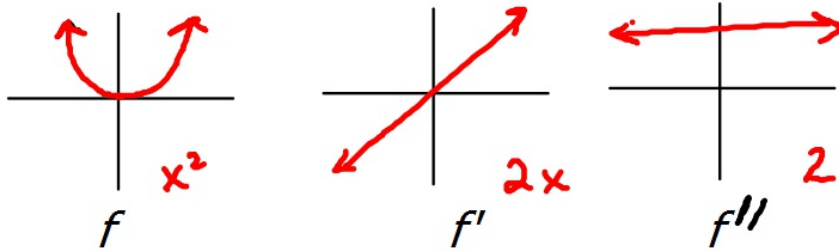
Four types of curvature

Concave up

Concave down

$f' < 0$
$f'' > 0$

$f' > 0$
$f'' > 0$

$f' > 0$
$f'' < 0$

$f' < 0$
$f'' < 0$

A   B

C

D

The S-curve

Inflection = where concavity changes

Inflection Point

What might this model?

- new toy demand
- bacteria growth
- Mozart's symphony production
- airline traffic
- ???

t

Concave up

x^2

f $2x$ f' 2 f''
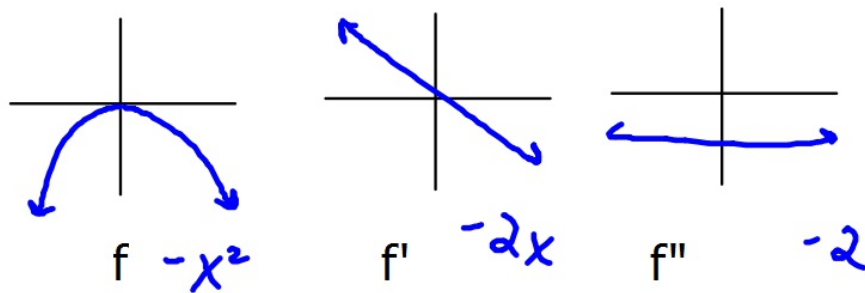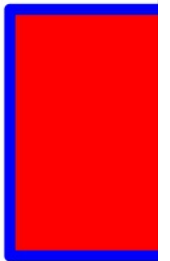
Concave down

f $-x^2$ f' $-2x$ f'' -2

F concave up means

$F'' > 0$

F concave down means
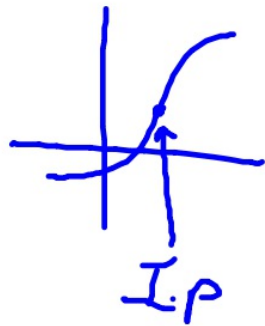
$F'' < 0$

Terrace Points: where f"(x)=0 or undefined

(Just like
  C.N , but w/ f")

Inflection point: where f"(x)=0 or undefined
                    AND f"(x) changes sign

(either
  direction)
+ ⌣ −
⌣ −
− ⟶ +
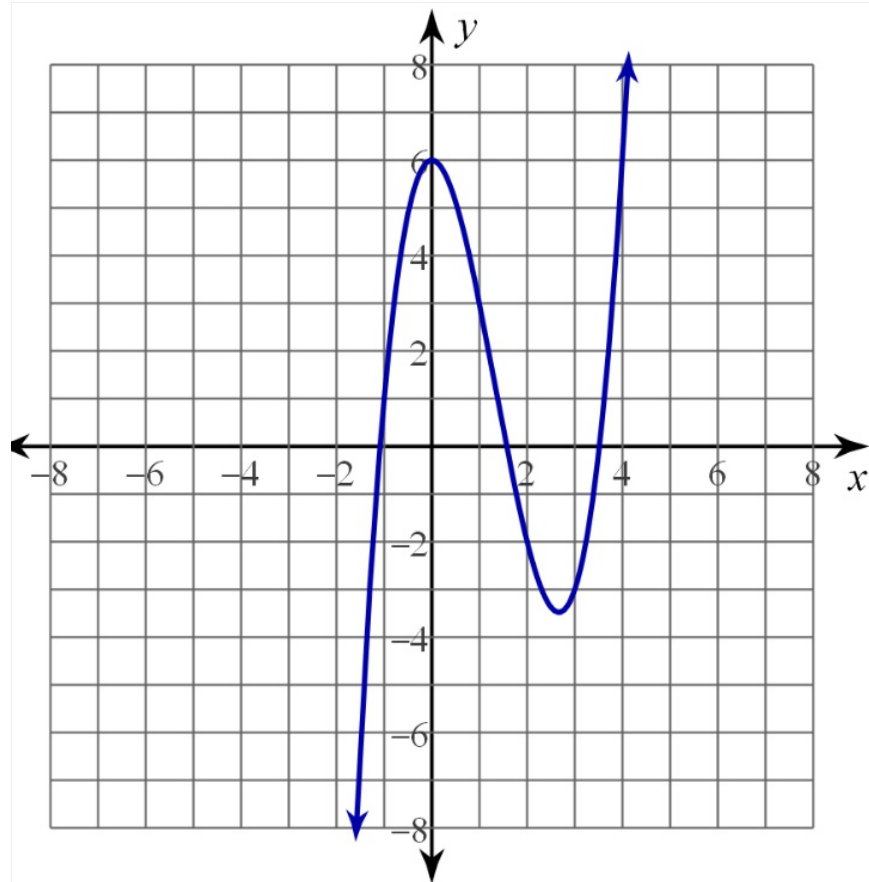
I.P

all inflection points
are terrace points

but not every terrace
point will be an inflection pt!!

Example:
Here is the first derivative of f(x). Over what intervals is f concave up and concave down?

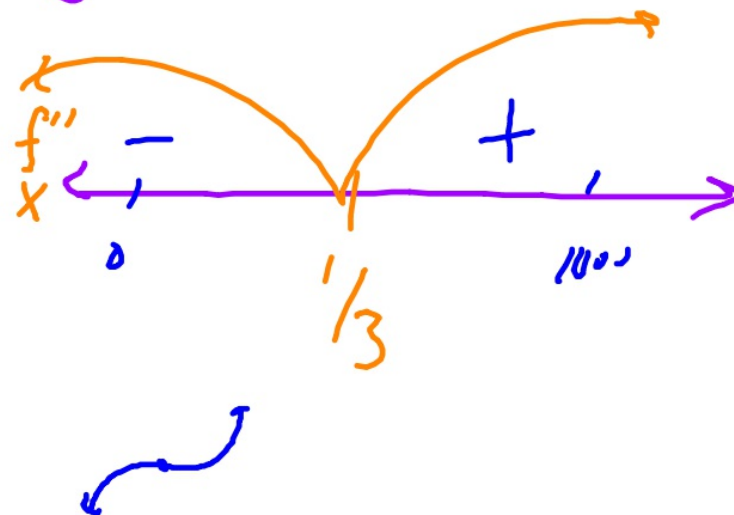Find the location of all inflection points for $f(x) = x^3 - x^2 - 1$

$$f'(x) = 3x^2 - 2x$$

$$f''(x) = 6x - 2 = 0$$

$$6x = 2$$

$$x = \frac{1}{3}$$

T.P.

f'' $-$ $+$

x $\xleftarrow{\hspace{1cm}}$ 0 $\quad$ $\frac{1}{3}$ $\quad$ 1000 $\rightarrow$

p. 192

#15-24

$$y = \frac{2x}{x+1}$$

Find any interval(s) over which the function is concave up.