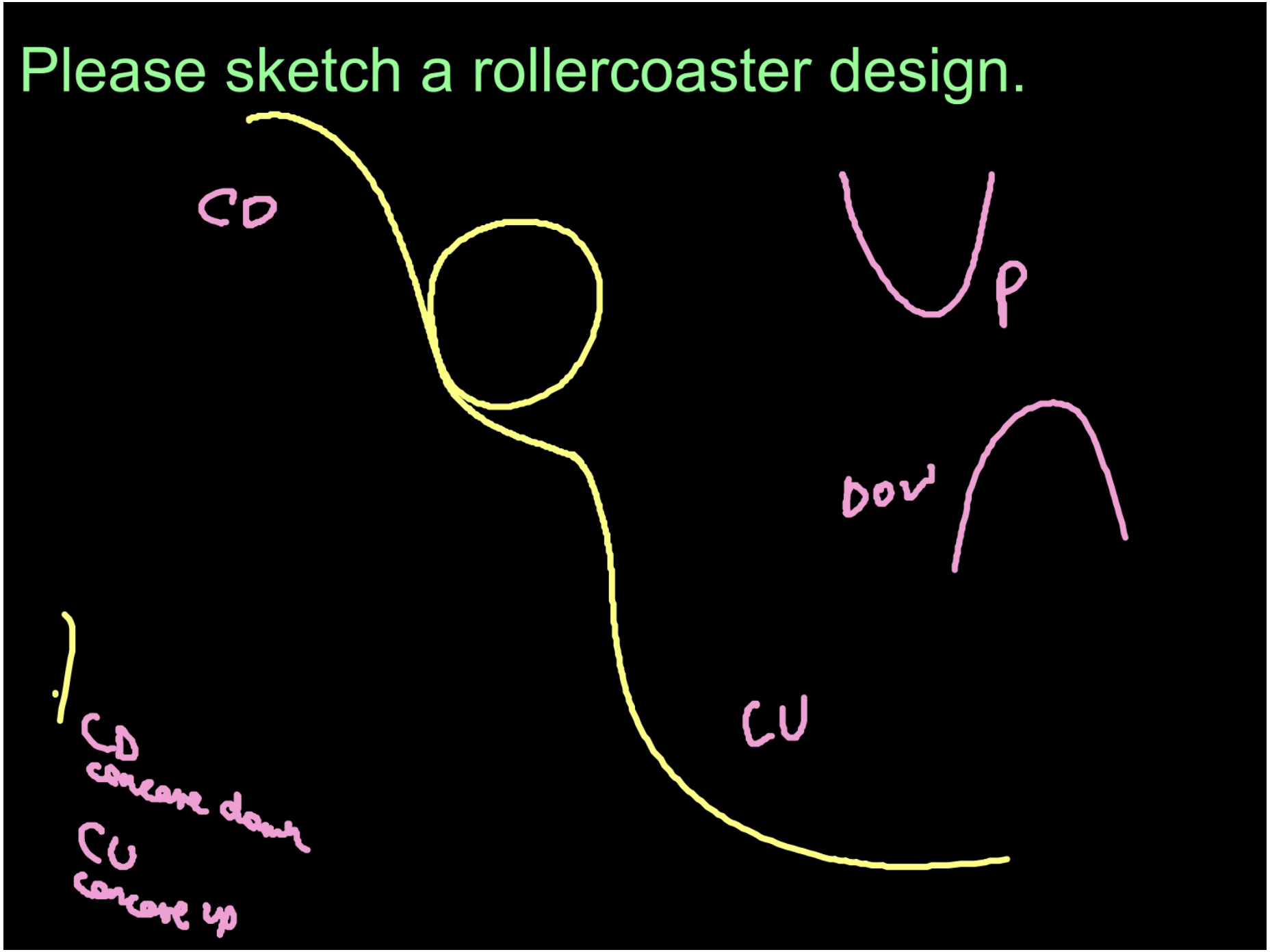
Please sketch a rollercoaster design.

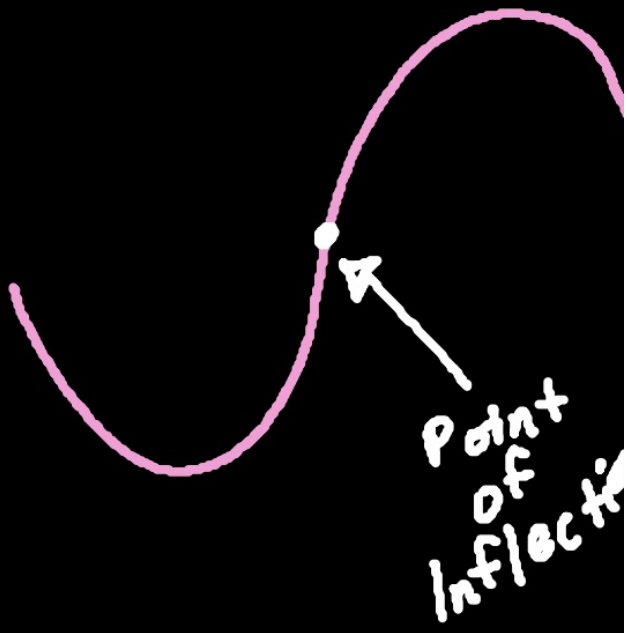


Today's learning objective:

By the end of class, I will be able to identify concavity and relate it to 2nd derivatives.

Today's language objective:

Concavity
Concave up
Concave down
Point of inflection



What is Apple's core competency?

phone

What is Honda's core competency?

cars

What is the f '(x)'s core competency?

gradient

What is f ''(x)'s core competency?

concavity

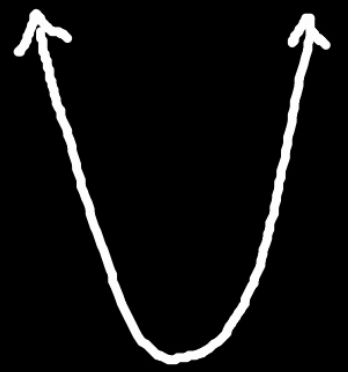
Create a very rough sketch of $f(x) = x^2$

Find $f''(x)$

What is interesting?

$f'(x) = 2x$

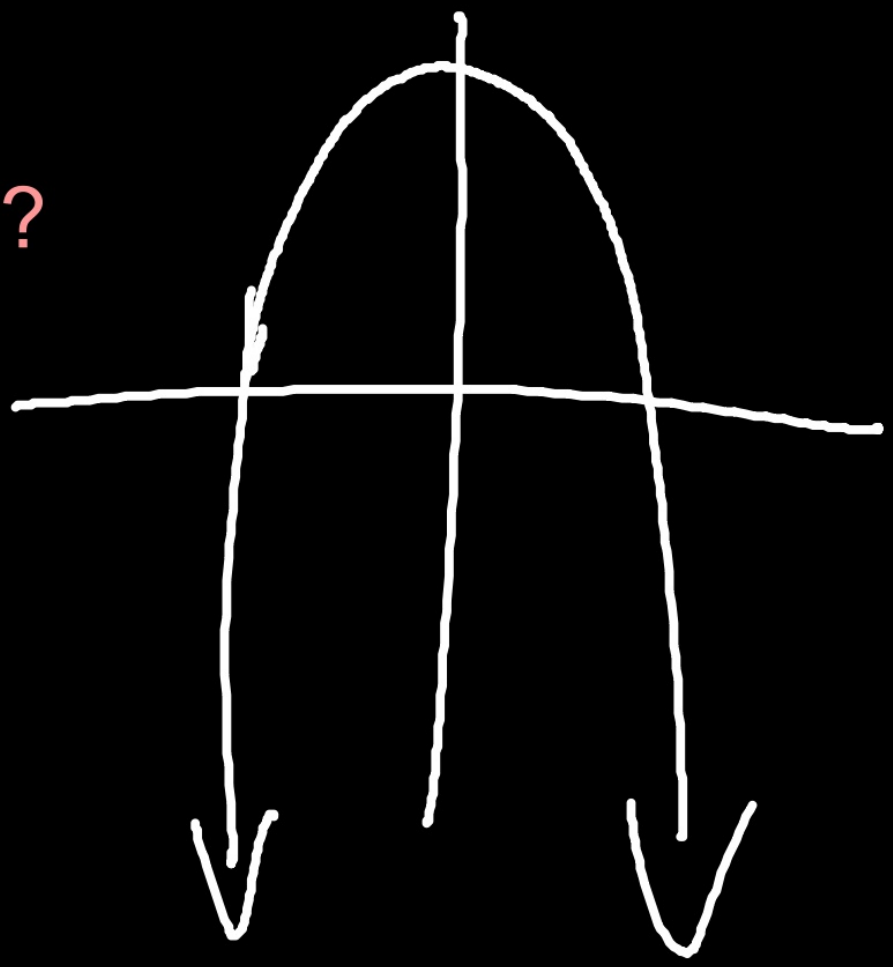
$f''(x) = 2$



Create a very rough sketch of $f(x) = -x^2$

Find $f''(x)$

What is interesting?



Using only the second derivative, find an input value that makes $f(x) = 0.5x^7 - 6x^2 + 2x + 4$ concave down.

$f''(x) = 21x^5 - 12$

$f'(x) = 3.5x^6 - 12x + 2$

Graph $f(x) = x^3 - 3x^2 - x - 1$

$3x^2 - 6x - 1$

Find $f''(x)$ $= 6x - 6 = 0$ $\quad x = 1 \quad f''(1) = 0$

Find the domain for positive and negative concavity. Po Inf

Solve $f''(x)$

$f''(x) = 0$

$x < 1$ Conc Down

$x > 1$ Conc Up

So what does f ''(x) = 0 indicate in the original function's graph?

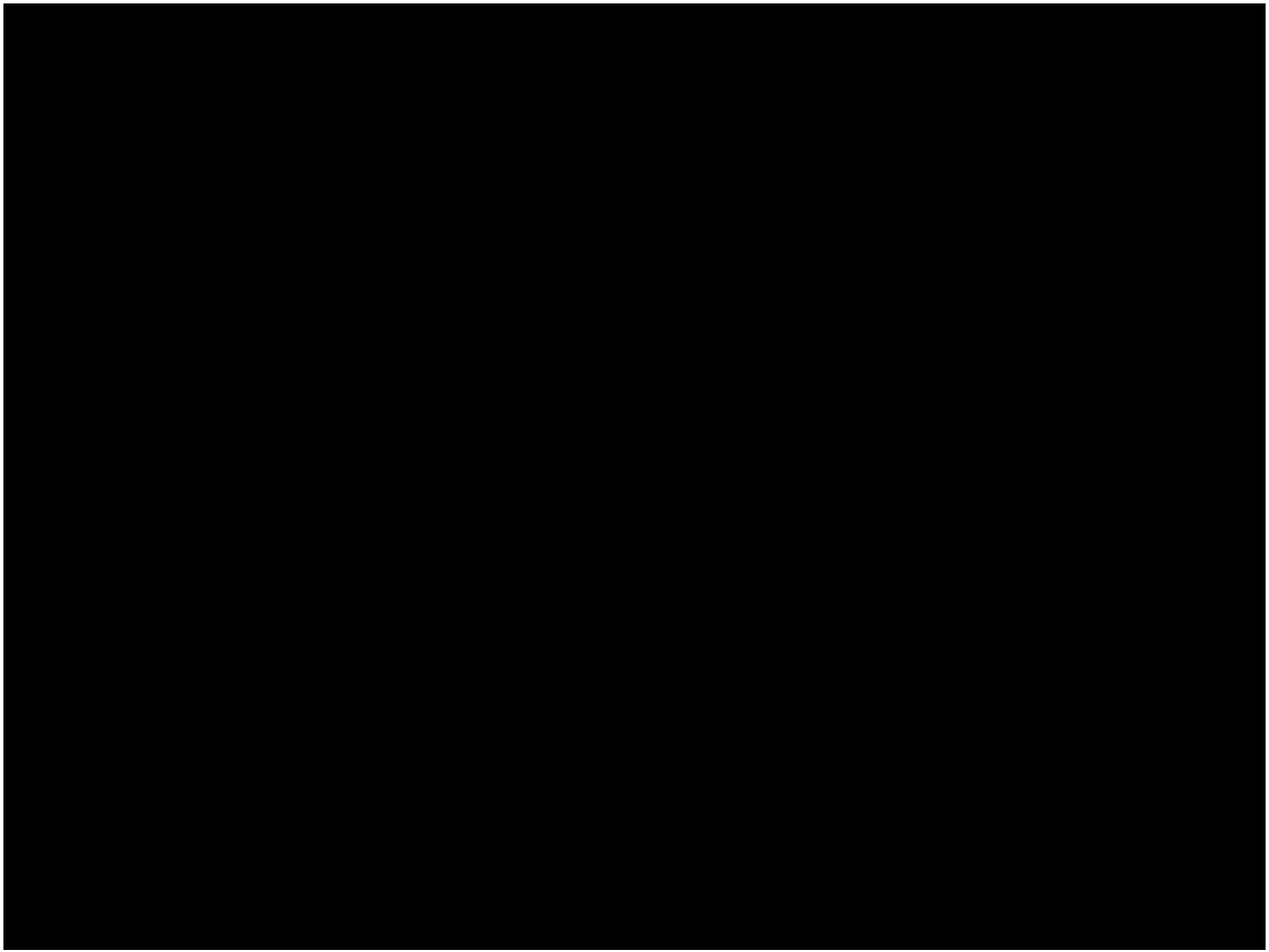
For $f(x) = 6x^4$, determine the input values that allow for negative concavity.

$72x^2 = f''(x)$

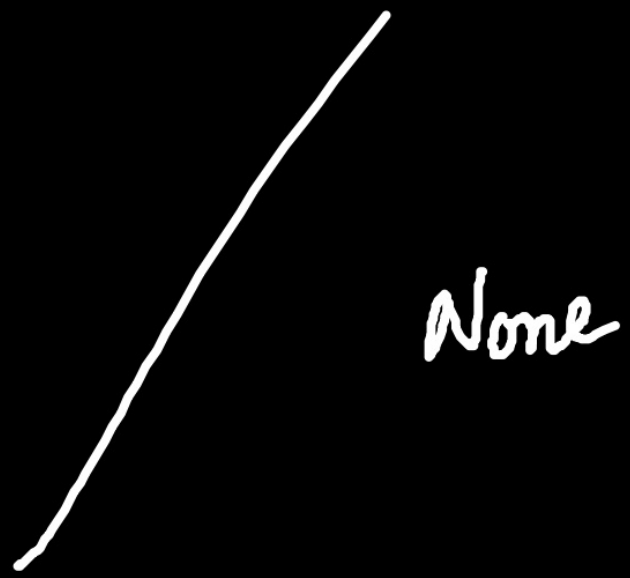
$72(i)^2$

$72(\sqrt{-1})^2$

$72(-1) =$



What type of concavity does f(x) = 3x exhibit?



What type of concavity does f(x) = ln x exhibit?

$f''(x)$

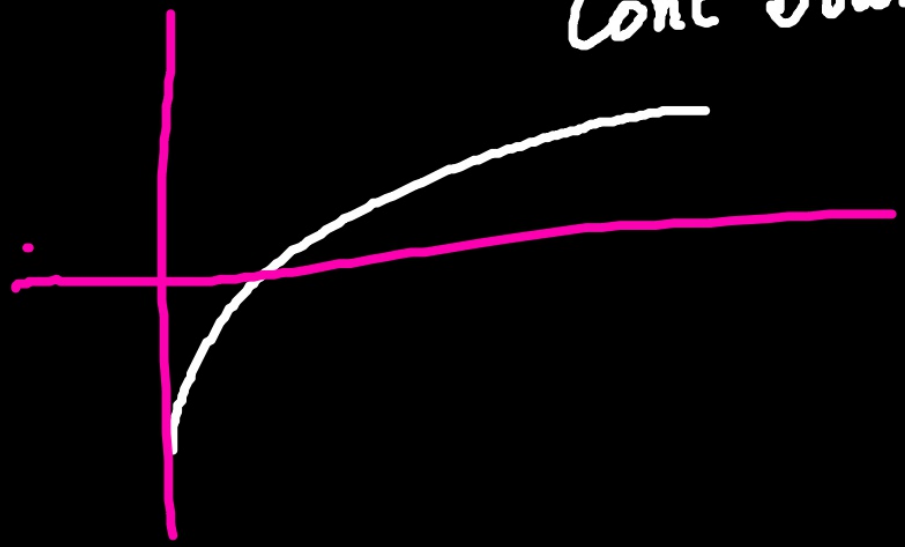
$f'(x) = \frac{1}{x}$

$f'(x) = x^{-1}$

$f''(x) = -x^{-2}$

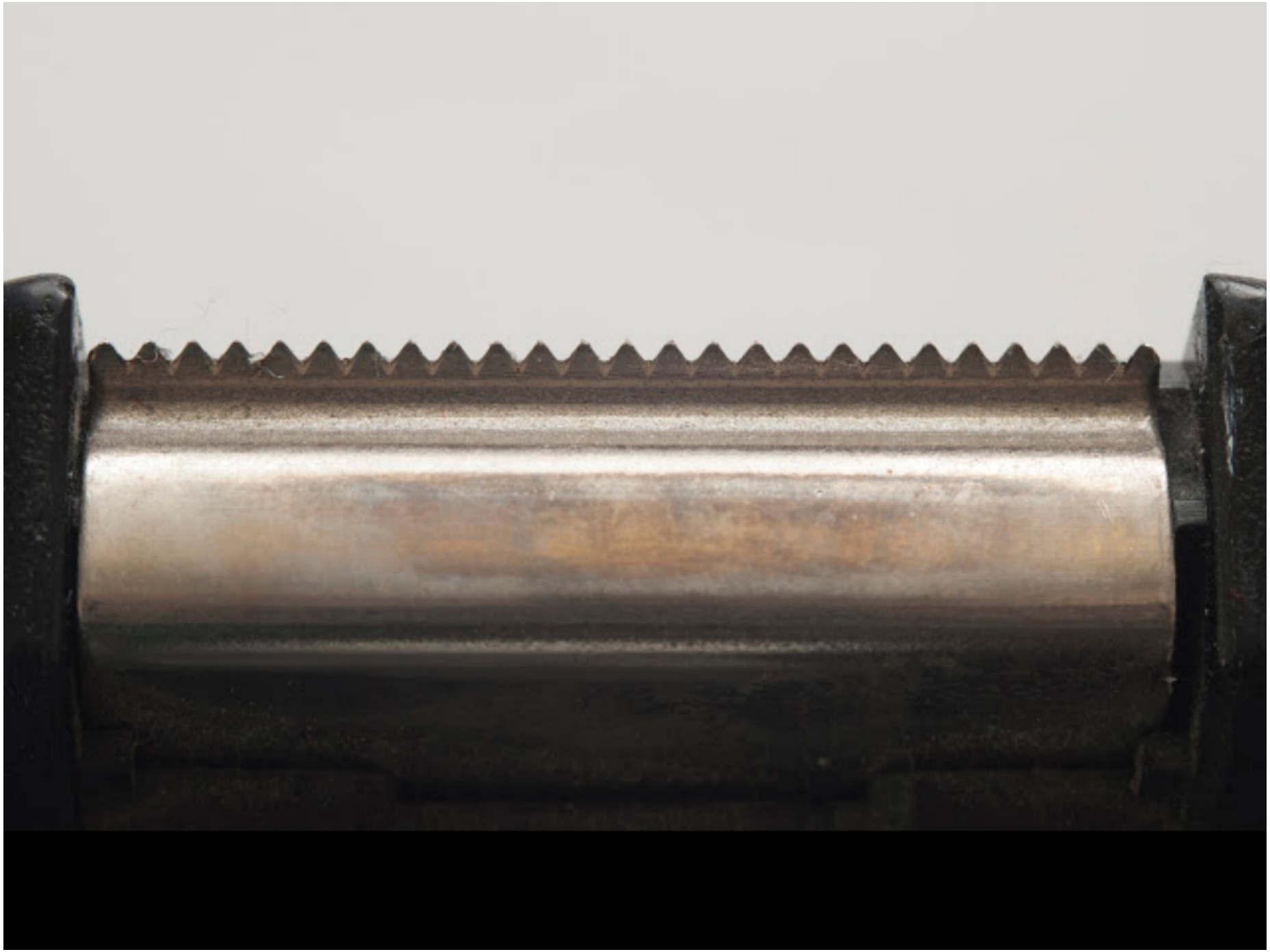
$f''(x) = \frac{-1}{x^2}$

Always Conc Down



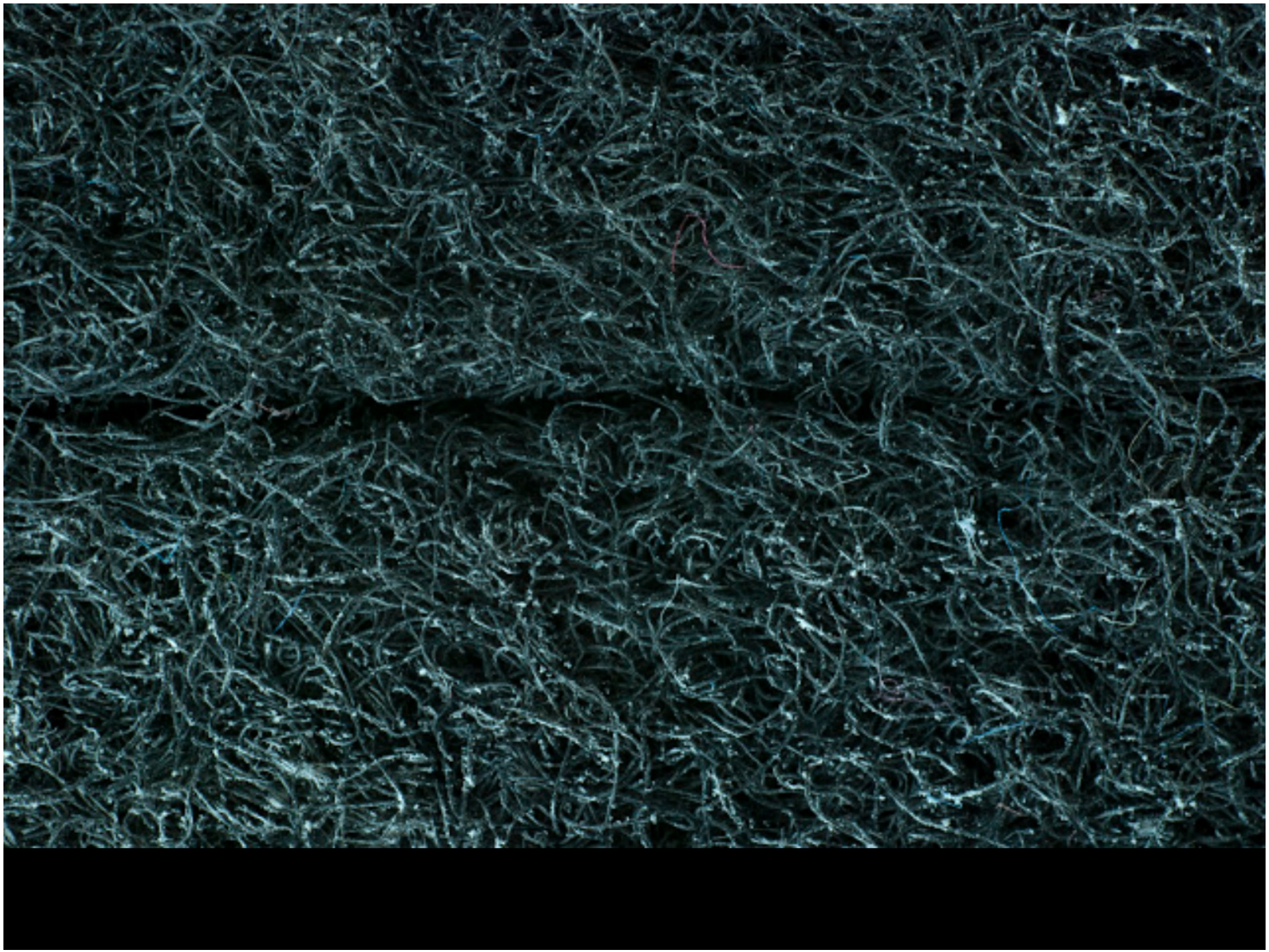
Has perspective ever made it challenging to determine meaning?

(Photos courtesy of floorsix.blogspot.com)




Scotch


scarlet
escarlata
écarlate

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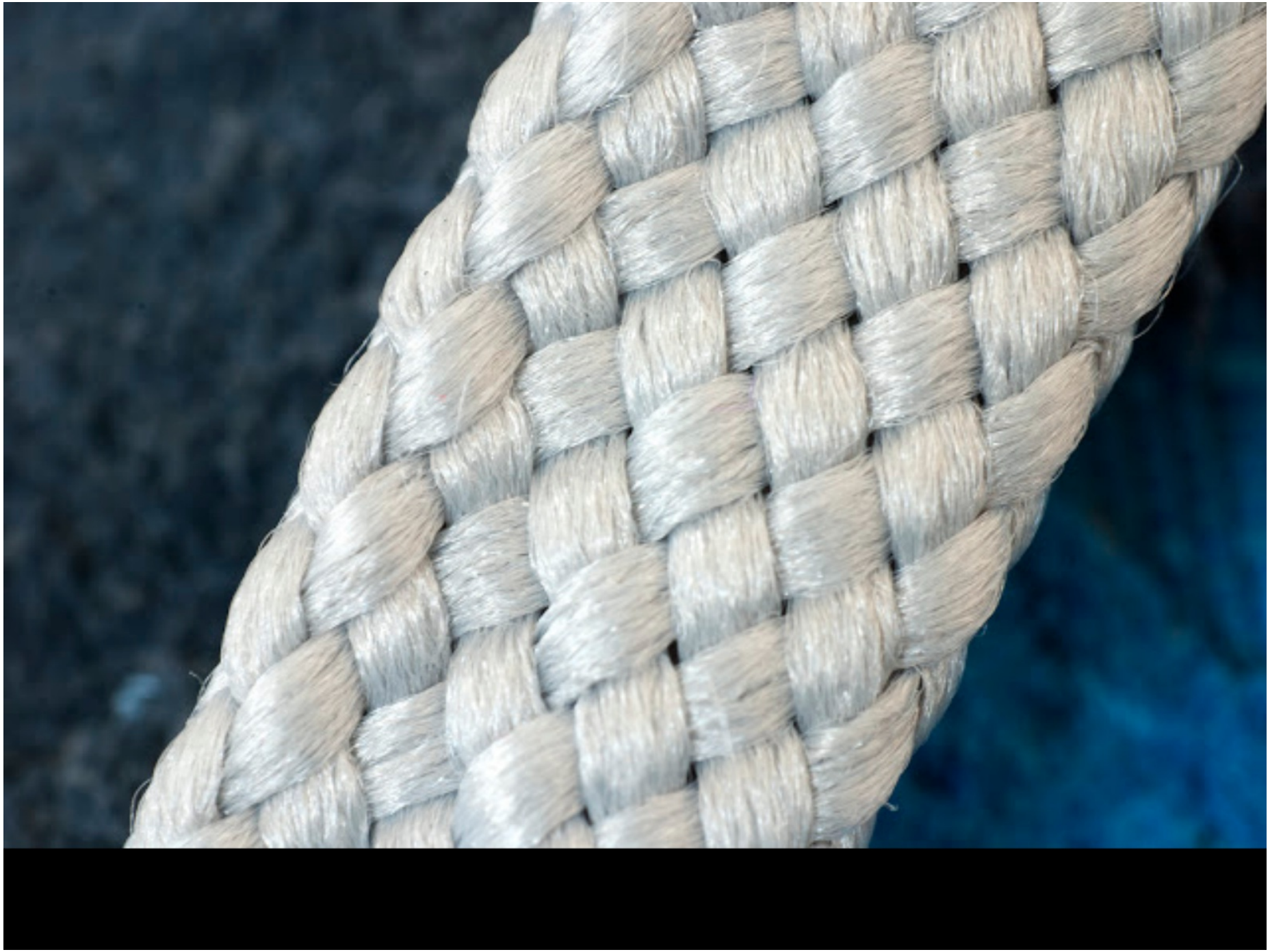


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12 FL OZ (355 mL)

Today's learning objective:

By the end of class, I will be able to interpret graphs of functions and derivatives by using perspective and empathy.

Today's language objective:

Zeros of functions
1st derivatives
2nd derivatives = concavity
Local minima & maxima of functions $f'(x)$
f '(x)
f ''(x)

That graph is of f(x). Given this information, answer the following questions:

1.) What are the x-values of the minima and maxima of the graph of f(x)?

$\{-3, -1, 2, 4\}$

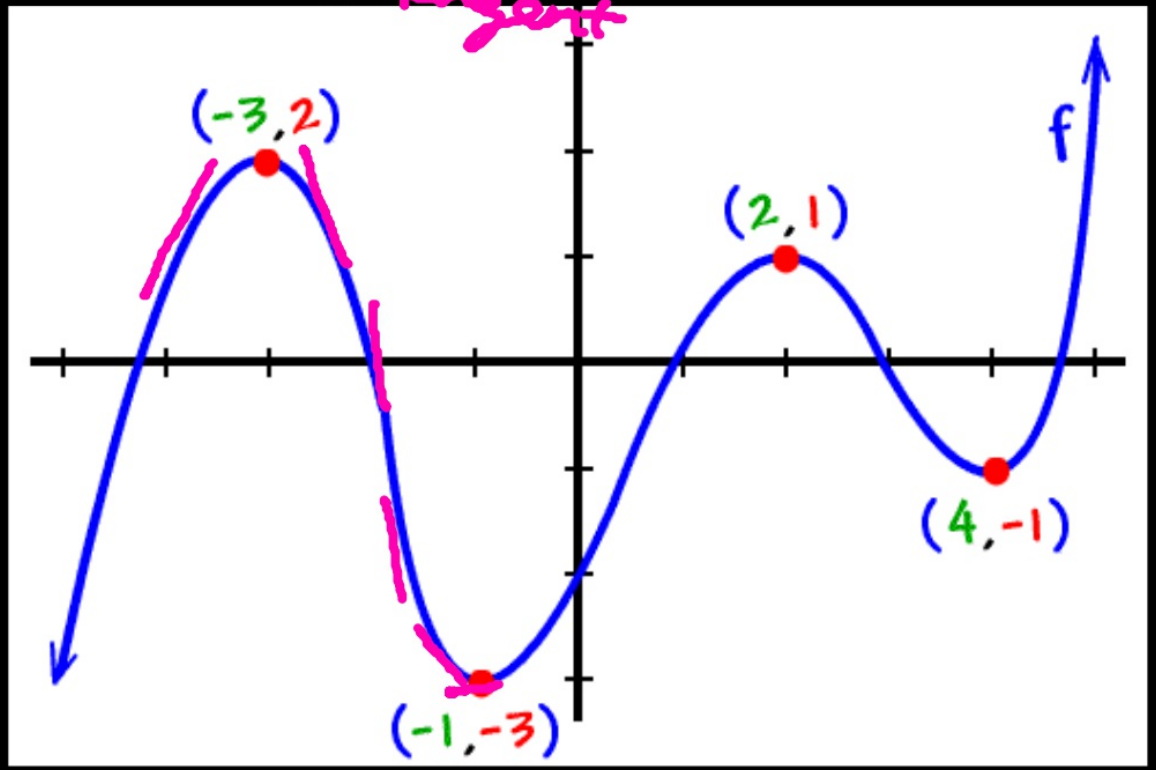
$(-3, -1)$
$(2, 4)$

2.) What are the intervals for f '(x) < 0.

$-3 < x < -1$
$2 < x < 4$

domain

gradient
tangent



The output of the second derivative helps us find p.o.i.

Points of inflexion.

When f ''(x) = 0, you have a point of inflection.

When f ''(x) = +, you are concave up.

When f ''(x) = –, you are concave down.

That graph is of f '(x). Given this information, answer the following questions:

1.) What are the x-values of the minima of the graph of f(x)?

0

$\{-4.2, 1, 4.8\}$

2.) What are the x-values of the maxima of the graph f(x)?

0

$\{-2, 3\}$

3.) Where are the x-values of the point(s) of inflexion of f(x)?

$\{-3, -1, 2, 4\}$

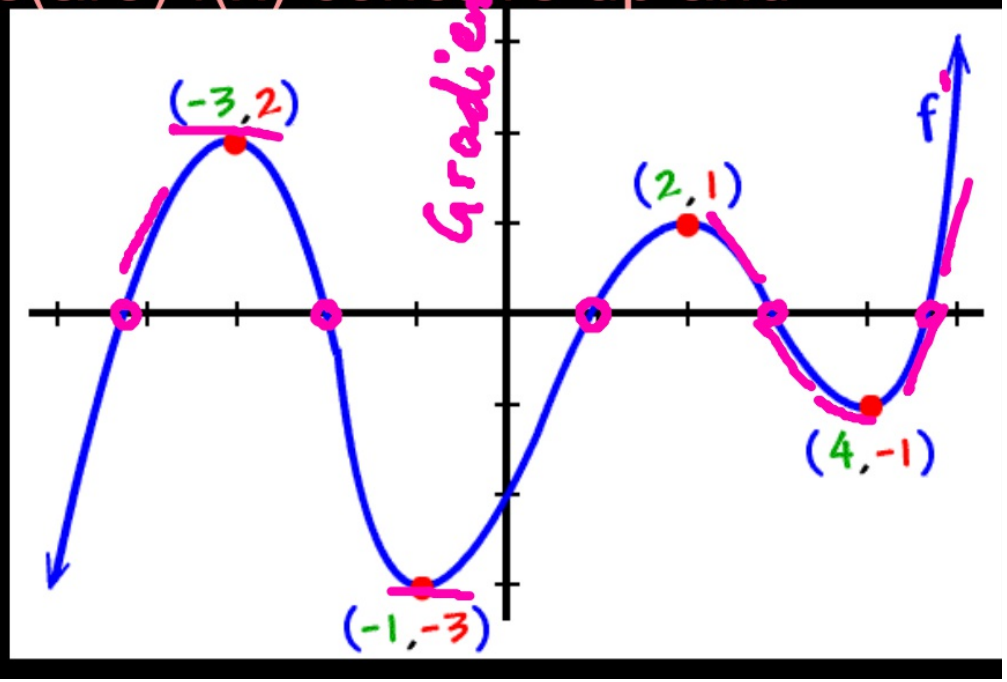
f''(x)

4.) Along which interval(s) is(are) f(x) concave up and concave down?

$(-\infty, -3)$

$-1 < x < 2$

$4 < x < \infty$



This graph is of f "(x). Given this information, answer the following questions:

1.) What is the domain for positive concavity of f(x)? $-4.2 < x < -2$; $1 < x < 3$ $4.6 < x < \infty$

2.) What is the domain for negative concavity of f(x)? $-\infty < x < -4.2$ $-2 < x < 1$ $3 < x < 4.6$

3.) Where are the x-values of the point(s) of inflexion of f(x)?