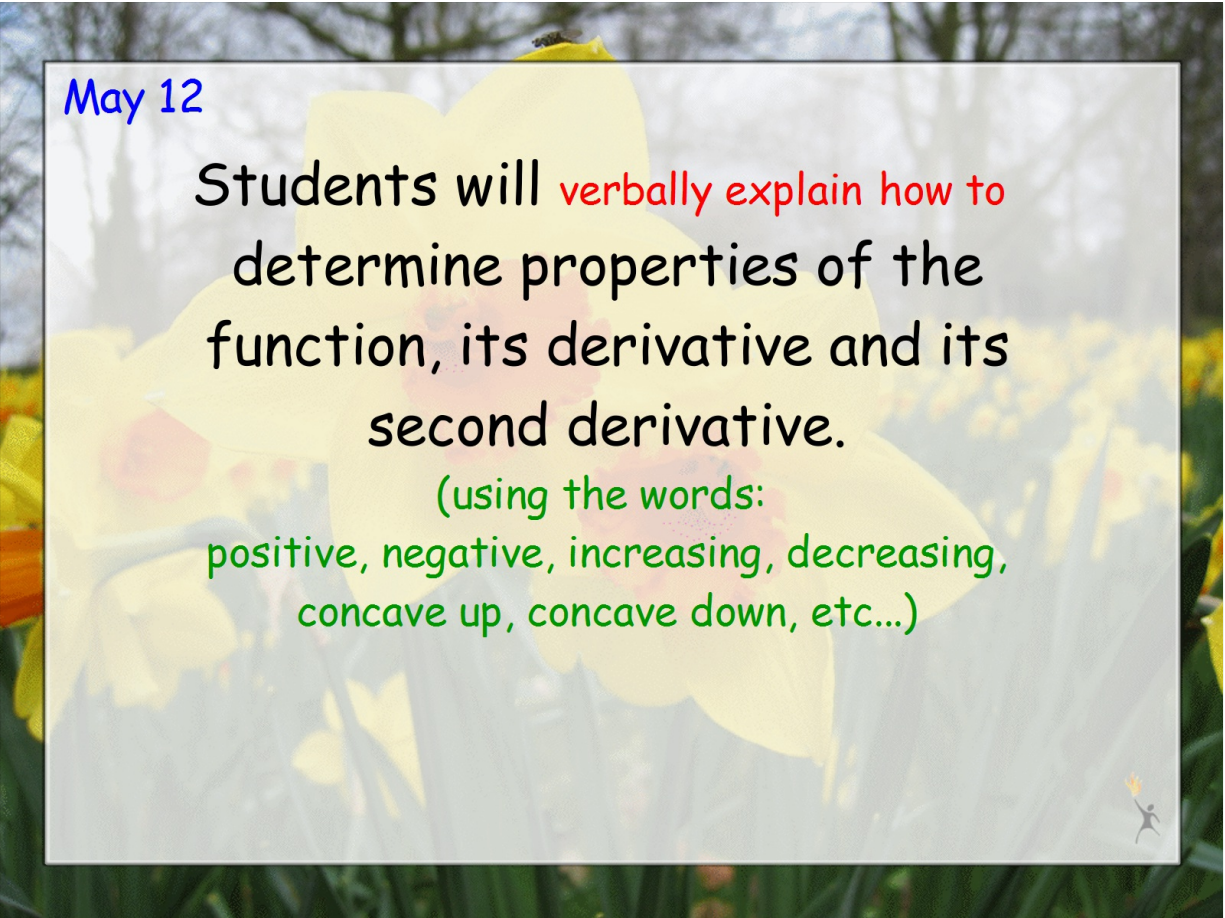


May 12, 2014

Write down everything you know
about quadratic functions.



May 12

Students will verbally explain how to
determine properties of the
function, its derivative and its
second derivative.

(using the words:
positive, negative, increasing, decreasing,
concave up, concave down, etc...)



Curve Sketching Discovery: Applications of Derivatives

Some Vocabulary First...

Root: x-intercept, where $y=0$

Concavity:

Concave up: ∪

Concave down: ∩

Inflection Point: where concavity changes

Conjecture: guess - statement you think is true

Critical Points: $f'(x)=0$ or undefined

I. Maximum/Minimum; Concavity

Example A. Consider $f(x) = x^2 - 4x$. Use algebra (complete the square) to find the following.

Vertex _____

Is the vertex a maximum or a minimum? minimum

Is $f(x)$ concave up (CU) or concave down (CD)? CU

Put the function, its first derivative and its second derivative in your calculator. Graph them one at a time to answer the following questions.

$$Y_1 = f(x) = x^2 - 4x$$

$$Y_2 = f'(x) = \underline{\hspace{2cm}}$$

$$Y_3 = f''(x) = \underline{\hspace{2cm}}$$

What is the root of Y_2 ? _____ Are the y values of $f''(x)$ positive or negative? _____

Using the example A, predict the zero of y' and the sign of y'' after finding the vertex and concavity algebraically.

Show your work for each example.

Function	Vertex	Max/Min	Concavity	Zero of y'	Sign of y''
B. $y = -x^2 + 8x$					
C. $y = x^2 + 6x - 4$					
D. $y = -2x^2 + 4x + 1$					

Completing the Square

$$-3x^2 + 12x - 15$$

(1) Set the equation equal to zero

(2) add/subtract constants to the other side

(3) divide all terms by the coefficient of x^2

(4) divide the coefficient of x by 2 and square the answer (side work)

(5) add your answer for step (4) to both sides of the equation

(6) factor the quadratic

(7) add/subtract constants back so the equation equals zero

(8) multiply everything by the original coefficient of x^2

vertex form: $y = a(x-h)^2 + k$

vertex: (h, k)

$$-3x^2 + 12x - 15 = 0$$

$$\begin{array}{r} -3x^2 + 12x = 15 \\ \underline{-3} \quad \underline{-3} \quad \underline{-3} \\ x^2 - 4x = -5 \end{array}$$

$$x^2 - 4x = -5$$

$$\begin{array}{l} -\frac{4}{2} = -2 \\ (-2)^2 = 4 \end{array}$$

$$x^2 - 4x + 4 = -5 + 4$$

$$(x-2)(x-2) = -1$$

$$(x-2)^2 + 1 = 0$$

$$-3((x-2)^2 + 1) = -3(0)$$

$$-3(x-2)^2 - 3 = 0$$

vertex: $(2, -3)$