p.171 #10

$$f(x) = ax^2+bx+c$$

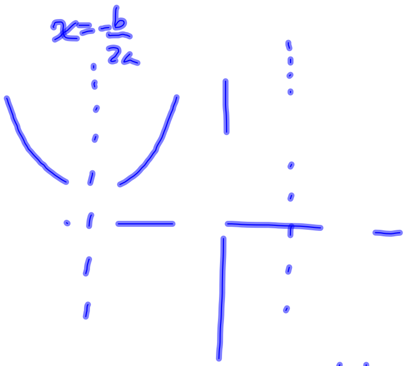
$$f'(x) = 2ax+b$$

$$0 = 2ax+b$$

$$-b = 2ax$$

$$x = -\frac{b}{2a}$$ ← equation of axis of symmetry. always.

	$x < -\frac{b}{2a}$	$x > -\frac{b}{2a}$



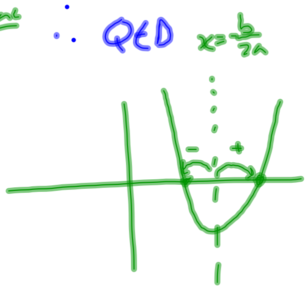
when $a>0$ parabola opens up.

∴ The critical point is always at $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$ and $a>0$, the parabola opens up always.

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$ $\neq 0$

$$= -\frac{b}{2a} \pm \frac{\sqrt{b^2-4ac}}{2a}$$

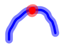
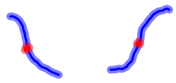
∴ QED



L2. (4.2) Critical Points & 1st Derivative Test

If $f'(a) = 0$, then $x = a$ is a critical value and $(a, f(a))$ is a critical point.

A critical point can be

- a maximum 
- a minimum 
- a point of inflection 

Not all critical points are found using the 1st derivative test...

Ex1: Consider the function defined by $f(x) = x^4 - 3x^3$.

a) Find all intercepts. (x-intercepts) & (y-int.)
b) Find all critical points.
c) Classify the critical points using an INC/DEC table.
d) Graph f(x).

a) $f(x) = x^3(x-3)$

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

$x = 0$ OR 3

b) $f'(x) = 4x^3 - 9x^2$

$0 = 4x^3 - 9x^2$

$= x^2(4x-9)$

$x=0$ OR $x = \frac{9}{4}$

$= 2.25$

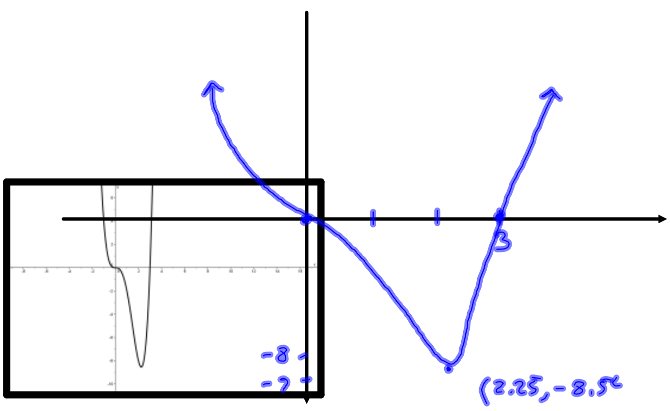
$f(0)=0 \qquad f(2.25) \doteq -8.54$

intervals	$x<0$	$0<x<\frac{9}{4}$	$(\frac{9}{4},\infty)$
x^2	+	+	+
$4x-9$	−	−	+
$f'(x)$	−	−	+

$x=0$ inflection pt

minimum

$x = \frac{9}{4}$ is a minimum



Assigned Work:

p. 178 #3, 4, 5bcd, 7cde