AP Calculus AB

Extra Credit

Graph the two parabolas $y=x^2$ and $y = -x^2+2x-5$ in the same coordinate plane. Find the equations of the lines that are simultaneously tangent to both parabolas.

a. $f(x) = x^2 - 8x + 4$

$f'(x) = 2x - 8$

$f''(x) = 2 \rightarrow f''(x)$ is always positive. This means $f(x)$ is always concave up.

There are no points of inflection.

d. $f(x) = 3\sqrt[3]{x} - 2$

$f'(x) = x^{-2/3}$

$f''(x) = -\frac{2}{3}x^{-5/3}$

$-\frac{2}{3}x^{-5/3} = 0$

$x^{-5/3} = 0$

$\frac{1}{\sqrt[3]{x^5}} = 0$

$f''(x)$ will never $= 0$, but $f''(x)$ is undefined when $x = 0$.

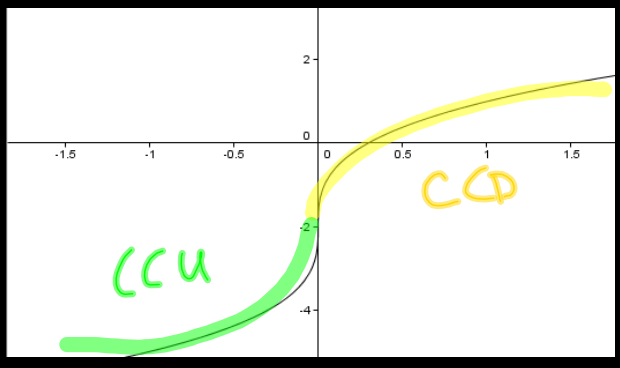
$f''(x)$

\+ | − | +

0

$f''(x) > 0$ when $x < 0$ ∴ $f(x)$ is concave up on $(-\infty, 0)$.

$f''(x) < 0$ when $x > 0$. ∴ $f(x)$ is concave down on $(0, \infty)$



The point of inflection is $(0, -2)$.