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

$f'(x) = -4x^3 + 4x = -4x(x^2 - 1) = -4x(x+1)(x-1)$

So we have critical points at x = -1, 0, 1

-4x + + + + + + + + +0 - - - - - - - - - - - - - -

x + 1 - - - 0 + + + + + + + + + + + + + + + + +

x – 1 - - - - - - - - - - - - - - - - - 0 + + + + + +

-1 0 1

f is increasing on $(-\infty, 1)\ and\ (0,1)$

f is decreasing on $(-1,0)\ and\ (1,+\infty)$

f has a relative minimum of 4 at x = 0

f has a relative maximum of 5 at x = ± 1

$f''(x) = -12x^2 + 4 = -4(3x^2 - 1)$

- 4 -

$3x^2$ - 1 + +0 - - - - - - - - - - - 0 + + + + + +

$-\frac{1}{\sqrt{3}}$ $\frac{1}{\sqrt{3}}$

f is concave down on $\left(-\infty, -\frac{1}{\sqrt{3}}\right) and \left(\frac{1}{\sqrt{3}}, +\infty\right)$

f is concave up on $\left(-\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$

f has an inflection points of

$\left(-\frac{1}{\sqrt{3}}, \frac{41}{9}\right) and \left(\frac{1}{\sqrt{3}}, \frac{41}{9}\right)$