5. $y = \frac{1}{12}x^4 - \frac{4}{3}x^3 + \frac{15}{2}x^2 - 2x + 1$

$y' = \frac{1}{12} \cdot 4x^3 - \frac{4}{3} \cdot 3x^2 + \frac{15}{2} \cdot 2x - 2$

$y' = \frac{1}{3}x^3 - 4x^2 + 15x - 2$

$y'' = \frac{1}{3} \cdot 3x^2 - 4 \cdot 2x^1 + 15$

$y'' = x^2 - 8x + 15$

$x^2 - 8x + 15 = 0$    (PSD)

$(x-3)(x-5) = 0$

$x - 3 = 0$    $x - 5 = 0$

$\boxed{x = 3 \qquad x = 5}$

6. $f(x) = x\sqrt{x^2 - 9}$

$= \underset{P}{\underline{x}} \left(\underset{Q}{\underline{x^2 - 9}}\right)^{\frac{1}{2}}$

$P' = 1$    $Q' = \frac{1}{2}(x^2 - 9)^{\frac{1}{2} - 1} \cdot \frac{d}{dx}(x^2 - 9)$

$= \frac{1}{2}(x^2 - 9)^{-\frac{1}{2}} \cdot 2x$

$= \frac{2x}{2(x^2-9)^{1/2}}$

$P'Q + PQ'$

$f'(x) = 1(x^2-9)^{1/2} + x\left(\frac{x}{(x^2-9)^{1/2}}\right)$

$Q' = \frac{x}{(x^2-9)^{1/2}}$

$= \frac{(x^2-9)^{1/2}}{1} + \frac{x^2}{(x^2-9)^{1/2}}$

$P = 2x^2 - 9$    $Q = (x^2-9)^{1/2}$

$= \frac{(x^2-9)^{1/2}(x^2-9)^{1/2}}{(x^2-9)^{1/2}} + \frac{x^2}{(x^2-9)^{1/2}}$

$P' = 4x$    $Q' = \frac{x}{(x^2-9)^{1/2}}$

$= \frac{x^2-9}{(x^2-9)^{1/2}} + \frac{x^2}{(x^2-9)^{1/2}}$

$f'(x) = \frac{2x^2 - 9}{(x^2-9)^{1/2}} \begin{array}{l} )P \\ )Q \end{array}$

$\frac{P'Q - PQ'}{Q^2}$

$f''(x) = \frac{4x(x^2-9)^{1/2} - (2x^2-9)\left(\frac{x}{(x^2-9)^{1/2}}\right)}{[(x^2-9)^{1/2}]^2}$

$= \frac{4x(x^2-9)^{1/2} - \frac{x(2x^2-9)}{(x^2-9)^{1/2}}}{(x^2-9)^1}$

$= \frac{4x(x^2-9)^{1/2}(x^2-9)^{1/2} - (x^2-9)^{1/2}\left(\frac{x(2x^2-9)}{(x^2-9)^{1/2}}\right)}{(x^2-9)^1(x^2-9)^{1/2}}$

Cont.

$f''(x) = \frac{4x(x^2-9) - x(2x^2-9)}{(x^2-9)^{3/2}}$

$= \frac{x[4(x^2-9) - (2x^2-9)]}{(x^2-9)^{3/2}}$

$= \frac{x[4x^2 - 36 - 2x^2 + 9]}{(x^2-9)^{3/2}}$

$f''(x) = \frac{x(2x^2 - 27)}{(x^2-9)^{3/2}} = 0$

$x(2x^2 - 27) = 0$

$\boxed{x = 0}$   $2x^2 - 27 = 0$

$2x^2 = 27$

$x^2 = \frac{27}{2}$

$x = \pm\sqrt{\frac{27}{2}}$

$x = \pm\frac{\sqrt{27}}{\sqrt{2}}$

$x = \pm\frac{\sqrt{3 \cdot 3 \cdot 3}}{\sqrt{2}}$

$x = \pm\frac{3\sqrt{3}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$\boxed{x = \pm\frac{3\sqrt{6}}{2}}$