

Determine the intervals of concavity and the inflection points

A)  $f(x) = x^{2/5}$

$$f(x) = x^{2/5}$$

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

$$f''(x) = -\frac{6}{25}x^{-8/5}$$

$$f''(-1) = -\frac{6}{25} < 0$$

$$f''(1) = -\frac{6}{25} < 0$$

$$f''(x) = \frac{-6}{25x^{8/5}}$$

$$f''(x) \neq 0$$

$$\underline{f''(x) \text{ VND}}$$

$$x = 0$$

## Local Extrema using 2<sup>nd</sup> derivative test

<p>① Find C.P.          ② Take 2<sup>nd</sup> der          ③ Substitute C.P.          into 2<sup>nd</sup> deriu</p> <p>Concave up at a critical pt means C.P. is a local min</p> <p>Concave down at a critical pt means C.P. is a local max</p>	<p>Determine the local extrema using the second derivative test</p> <p>A) <math>y = x^2</math></p> <p><math>f(x) = x^2</math>  <math>f'(x) = 2x</math>  <math>2x = 0 \Rightarrow x=0</math></p> <p>B) <math>y = -x^2</math>  <math>f(x) = -x^2</math>  <math>f'(x) = -2x \Rightarrow 0 = -2x \Rightarrow x=0</math></p> <p><math>f''(x) = 2 &gt; 0</math>  <math>f''(0) = 2 &gt; 0</math></p> <p>At C.P. <math>f(x)</math> is concave up so <math>x=0</math> is a local min.</p> <p><math>f''(x) = -2 &lt; 0</math>  <math>f''(0) = -2 &lt; 0</math></p> <p>At the C.P. <math>f(x)</math> is concave down so <math>x=0</math> is local max</p> <p>Determine the local extrema using the second derivative test</p> <p>25) <math>f(x) = x^3 - 12x^2 + 45x</math></p> <p><math>f(x) = x^3 - 12x^2 + 45x</math>  <math>f'(x) = 3x^2 - 24x + 45</math>  <math>0 = x^2 - 8x + 15</math>  <math>0 = (x-5)(x-3)</math>          C.P. <math>x=3</math> <math>x=5</math></p> <p><math>f''(x) = 6x - 24</math>  <math>f''(3) = -6 &lt; 0</math>  <math>x=3</math> local max since <math>f'' &lt; 0</math></p> <p><math>f''(5) = 6 &gt; 0</math>  <math>x=5</math> local min since <math>f'' &gt; 0</math></p> <p>27) <math>f(x) = 3x^4 - 8x^3 + 6x^2</math></p>
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