ALA 04 (HA) zum 02.05.2013

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1. a) (i) $f'(x) = 35x^4 + 9x^2 + 1$

(ii) $f'(x) = 8(3x^7 - 4x^3 + x^2 - 3x + 1)^7 \cdot (21x^6 - 12x^2 + 2x - 3)$

(iii) $f'(x) = (3x^4 + 2x)(\frac{x}{\sqrt{x^2+1}}) + (12x^3 + 2)\sqrt{x^2 + 1}$

(iv) $f'(x) = (x^3 + 1)(\frac{4x^3+6x}{x^4+3x^2+1}) + 3x \cdot \ln\left(x^4 + 3x^2 + 1\right)$

(v) $f'(x) = e^{x^3+x^2+1}\left(\frac{1}{2\sqrt{x}} + 3x^2\sqrt{x} + 2x\sqrt{x}\right)$

(vi) $f'(x) = \frac{4x^3}{2\sqrt{x^4+1}} \cdot \ln(x) + \frac{1}{x}\sqrt{x^4 + 1}$

b) $q(x) = \frac{5x^2+1}{x-3}$

$q'(x) = \frac{10x(x-3)-(5x^2+1)}{(x-3)^2} = \frac{5x^2-30x-1}{(x-3)^2}$

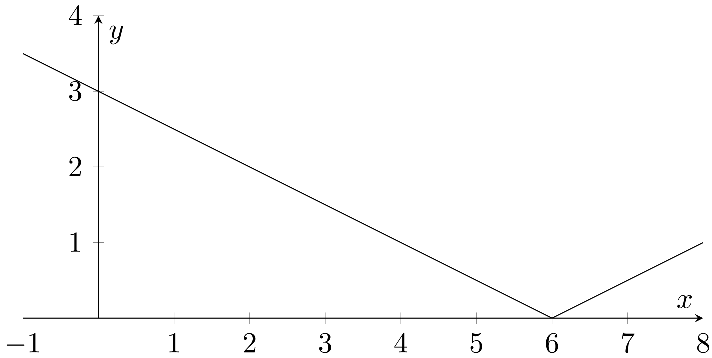
$q''(x) = \frac{(10x-30)(x-3)^2-(5x^2-30x-1)\cdot 2(x-3)}{(x-3)^4} = \frac{10(x-3)^2-10x^2+60x+2}{(x-3)^3}$

$q'''(x) = \frac{(20(x-3)-20x+60)(x-3)^3-\left(10(x-3)^2-10x^2+60x+2\right)\cdot 3(x-3)^2}{(x-3)^6} = -\frac{21}{(x-3)^4}$

2.

$$\lim_{x\to 6}\left(\frac{f(x)-f(6)}{x-6}\right) = \lim_{x\to 6}\left(\frac{|3-\frac{1}{2}x| - |3-\frac{1}{2}\cdot 6|}{x-6}\right) = \lim_{x\to 6}\left(\frac{|3-\frac{1}{2}x|}{x-6}\right) =$$

$$\lim_{x\to 6}\left(\sqrt{\frac{(3-\frac{1}{2}x)^2}{(x-6)^2}}\right) = \sqrt{\lim_{x\to 6}\left(\frac{9-3x+\frac{1}{4}x^2}{x^2-2x+36}\right)} = \sqrt{\frac{1}{4}} = \frac{1}{2}$$



3. a)

4. a)