

6.3 a)  $f(x) = -2x^3 + x^2 - x + 1$

$f'(x) = -6x^2 + 2x - 1 \Rightarrow f'(2) = -6 \cdot 2^2 + 2 \cdot 2 - 1 = -21$

b)  $f(t) = 125t^2 - 110t$

$f'(t) = 250t - 110 \Rightarrow f'(2) = 250 \cdot 2 - 110 = 390$

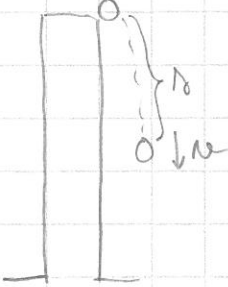
6.4 a)  $f(x) = 2x^3(8 - 4x + x^2) = 16x^3 - 8x^4 + 2x^5$

$f'(x) = 48x^2 - 32x^3 + 10x^4$

b)  $g(t) = 3t(t+4)^2 = 3t(t^2 + 8t + 16) = 3t^3 + 24t^2 + 48t$

$g'(t) = 9t^2 + 48t + 48$

6.8



$s(t) = 4,9t^2 \text{ (m)}$

Wopeus on kuljetin matkan muutoksen eli derivaatta:

$v = v(t) = s'(t) = 9,8t \text{ (m/s)}$

a)  $v(2) = 9,8 \cdot 2 = 19,6 \text{ m/s} \approx 20 \text{ m/s}$

b)  $v(3) = 9,8 \cdot 3 = 29,4 \text{ m/s} \approx 29 \text{ m/s}$



6.19

$f(x) = ax^2 + bx + c$

3 tuntemattomaa (a, b ja c)  $\rightarrow$  tarvitaan

$f'(x) = 2ax + b$

3 yhtälöä

$f''(x) = 2a \leftarrow$  funktion  $f$  2. derivaatta

$f(2) = a \cdot 2^2 + b \cdot 2 + c = 4$

$f'(2) = 2a \cdot 2 + b = -2 \Rightarrow 4 \cdot 3 + b = -2 \Rightarrow b = -14$

$f''(2) = 2a = 6 \Rightarrow a = 3$

$\Rightarrow 4 \cdot 3 + 2 \cdot (-14) + c = 4 \Rightarrow c = 20$

vast.  $f(x) = 3x^2 - 14x + 20$

6.22

a)  $\lim_{h \rightarrow 0} \frac{f(2+h) - f(2)}{h}$

$= f'(2) = 15 \cdot 2^{14} = 245760$

$f'(a) = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$

$f(x) = x^{15} \Rightarrow f'(x) = 15 \cdot x^{14}$