Week in Review # 6
Sections 3.1, 3.2, 3.3, 3.4, 3.5

Things to know:
- Be able to find derivatives using the derivative rules.
- Be able to find the equation of the tangent line using the derivative rules.
- Know the different notation for the derivative.
- Know how to compute higher ordered derivatives.

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1. Find the derivatives for the following functions. Assume that a, b, and k are constants.

   (a) $y = \dfrac{3}{t^2} - 4t^6 + 5$

   (b) $u = 3aq^4 + q^{1.45} + b^3$

   (c) $f(x) = 6\sqrt[3]{x^4} + \dfrac{k}{2x^5}$

   (d) $y = \dfrac{5x^4 + 7x^2 - 2x + 3}{x}$

2. Find the equation of the tangent line for the function $y = x^3 e^{(x^2-4)} + 3x$ at $x = 2$

3. Find the value for a for the function $y = 4x^3 + ax^2 + 3x + 2$ so that the rate of change at $x = 1$ is 10.

4. Find the values of x where the function $y = x^4 - 4x^2 + 10x + 5$ has an instantaneous rate of change of 10.

5. Suppose the depth of the water, in meters, is a function of time, in hours, since 6am is given by $y = 7 + 3.8\sin(0.628x)$. How quickly is the water rising or falling at 9am? at Noon?

6. If the position function for an object is given by $s(x) = 7x^3 - 15x^2 - x + 25$. Find the velocity function and the acceleration function.

7. Find the derivative for the following functions.

(a) $f(x) = \sqrt[6]{x^3 + 7x^2 + 6}$

(b) $h(t) = 3e^{3t^2+4} + 5^{4t-5}$

(c) $y = (x^3 + 5x)\cos(x^4)$

(d) $y = 2^{\sin(3x)} + \ln(x^4 + 7x^3 + 15)$

(e) $g(x) = e^{-5x^2}\sqrt{x^8 + x - 6}$

(f) $y = \dfrac{x^2 + 5}{x^4 - 2x - 1}$

(g) $y = \left(\dfrac{x^4 + 7x + 1}{\cos(5x)}\right)^4$

(h) $g(a) = \ln\left(2a + e^{\sin(3a)}\right)$

(i) $y = \ln\left(\dfrac{7x^2 + 5}{10 - x^5}\right)$

(j) $f(x) = \ln\left((x^4 + 5)^7 \cos(3x^2)\right)$

(k) $y = 7^{(2-3x^2)}\ln(5 - 2x)$