Worksheet 11: $\frac{d}{dx}$ + Review

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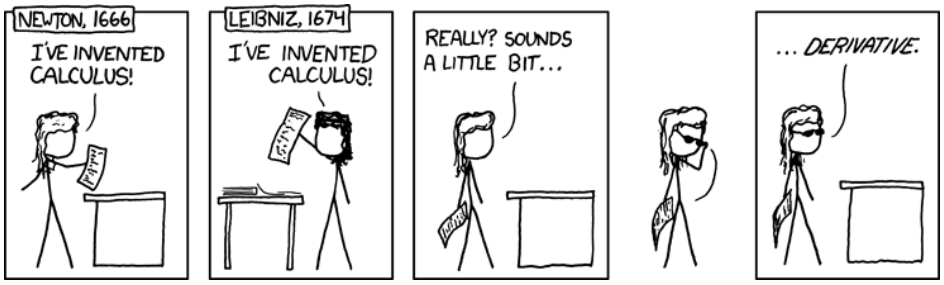

www.xkcd.com

1. Write the general form for:

   (a) The Product Rule

   (b) The Quotient Rule

2. Find the derivative.

   (a) $f(x) = e^x + 14\pi^2 e^4 + x^\pi + 4x^e + \frac{x+2}{\sqrt{x}}$

   (b) $y = \frac{x^3}{1-x^2}$

   (c) $g(x) = \sqrt{x}e^x$

   (d) $z = \frac{t}{(2t-1)^2}$

   (e) $v(t) = \frac{t-\sqrt{t}}{t^{\frac{1}{3}}}$

   (f) $K(y) = \frac{y(1-y^{\frac{4}{5}})}{y(e^y)}$

3. True or False; if true, give an explanation as to why. If false, give a counterexample.

   (a) If f,g are differentiable, then $\frac{d}{dx}[f(x) + g(x)] = f'(x) + g'(x)$.

(b) If f,g are differentiable, then $\frac{d}{dx}[f(x)g(x)] = f'(x)g'(x)$.

(c) If $y = e^2$, then $y' = 2e$.

(d) The derivative of a polynomial is a polynomial.

4. Determine for what values of x the function $f(x) = x|x|$ is differentiable and find a formula for f'.

5. Find all points on the curve $y = \frac{7}{3}x^3 + \frac{1}{4}x^4 + 6x^2$ where the tangent is horizontal.

6. Solve.

(a) $\lim_{x\to\infty} \dfrac{11x^3 - 5}{x^2 - 5x + 11}$

(b) $\lim_{x\to-\infty} \dfrac{(2x+1)(x+17)}{(x+4)(x+7)}$

(c) $\lim_{x\to 4} \dfrac{2 - \sqrt{x}}{4x - x^2}$

7. Let $f(x)$ be a curve.

- Give an expression for the secant line through points $(y, f(y))$ and $(z, f(z))$

- Give an expression for the tangent line through the point $x = w$