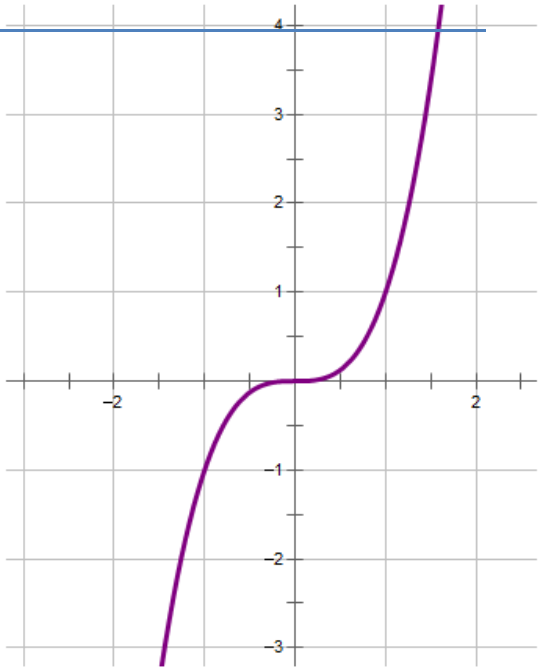

The Power Rule

If $y = x^n$ then $\frac{dy}{dx} = nx^{n-1}$

Example: If $f(x) = x^3$

then $f'(x) =$

and

$f'(1) =$

We will now prove that for $y = x^n$ then $\frac{dy}{dx} = nx^{n-1}$ for all $n \epsilon N$.

How about $n \epsilon I$? (negative values). Does hold. Homework question. Prove later?

Other rules for differentiation…

Constant rule: $\frac{d}{dx}(k) = 0$ where k is a constant

Constant multiple rule: If $f(x) = kg(x)$ where k is a constant then $f'(x) = kg'(x)$.

Sum Rule: If $f(x) = p(x) + q(x)$, then $f'(x) = p'(x) + q'(x)$.

Use the above rules to find the derivative of $f(x) = 3x^4 - 2x^2 + 9$

Equations of Tangent Lines and Normals

A ***tangent line*** touches a curve at only one point. The slope of a tangent line tells us the instantaneous rate of change at that point on the curve.
A ***normal*** is the line perpendicular to the tangent line at any given point on the curve.

Example: Let $f(x) = x^3 - 4x^2 + 7$. Find the equation of tangent line and the normal to the curve at point where x = 1.

Example Find the equation of the tangent line to $y = \frac{1}{x^2} - \frac{2}{x^3}$ at the point where x = 2.

Homework: text page 64 #4acehik, 6 and page 11 #7cfg, 8, **problem 2**

Also prove that if $f(x) = x^{-2}$ then $f'(x) = \frac{-2}{x^3}$ using first principles (from definition of derivative)