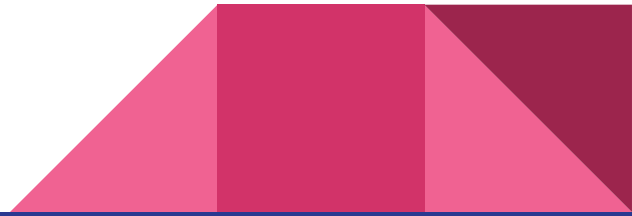
Practice with basic derivatives

MTH 201 -- Module 4A part 2

Agenda

- Activity 2.1.3: 5 minutes to work as far as you can on your own.
- Then into groups for questions and mutual help. TALK TO EACH OTHER.
- Then to the Jamboard to present work on one of the parts.

Repeat for activity 2.1.4.



Activity 2.1.3. Use only the rules for constant, power, and exponential functions, together with the Constant Multiple and Sum Rules, to compute the derivative of each function below with respect to the given independent variable. Note well that we do not yet know any rules for how to differentiate the product or quotient of functions. This means that you may have to do some algebra first on the functions below before you can actually use existing rules to compute the desired derivative formula. In each case, label the derivative you calculate with its name using proper notation such as $f'(x)$, $h'(z)$, dr/dt, etc.

a. $f(x) = x^{5/3} - x^4 + 2^x$

b. $g(x) = 14e^x + 3x^5 - x$

c. $h(z) = \sqrt{z} + \dfrac{1}{z^4} + 5^z$

d. $r(t) = \sqrt{53}\, t^7 - \pi e^t + e^4$

e. $s(y) = (y^2 + 1)(y^2 - 1)$

f. $q(x) = \dfrac{x^3 - x + 2}{x}$

g. $p(a) = 3a^4 - 2a^3 + 7a^2 - a + 12$

Activity 2.1.4. Each of the following questions asks you to use derivatives to answer key questions about functions. Be sure to think carefully about each question and to use proper notation in your responses.

a. Find the slope of the tangent line to $h(z) = \sqrt{z} + \frac{1}{z}$ at the point where $z = 4$.

b. A population of cells is growing in such a way that its total number in millions is given by the function $P(t) = 2(1.37)^t + 32$, where t is measured in days.

   i. Determine the instantaneous rate at which the population is growing on day 4, and include units on your answer.

   ii. Is the population growing at an increasing rate or growing at a decreasing rate on day 4? Explain.

c. Find an equation for the tangent line to the curve $p(a) = 3a^4 - 2a^3 + 7a^2 - a + 12$ at the point where $a = -1$.