Exercise 91

Computer algebra systems have commands that differentiate functions, but the form of the answer may not be convenient and so further commands may be necessary to simplify the answer.

(a) Use a CAS to find the derivative in Example 5 and compare with the answer in that example. Then use the simplify command and compare again.

(b) Use a CAS to find the derivative in Example 6. What happens if you use the simplify command? What happens if you use the factor command? Which form of the answer would be best for locating horizontal tangents?

Solution

The function in Example 5 is

$$g(t) = \left(\frac{t-2}{2t+1}\right)^9,$$

and the function in Example 6 is

$$y = (2x+1)^5(x^3 - x + 1)^4.$$

Part (a)

Use Mathematica to differentiate the function in Example 5.

$$g'(t) = -\frac{18(-2+t)^9}{(1+2t)^{10}} + \frac{9(-2+t)^8}{(1+2t)^9}$$

Use Mathematica's Simplify command.

$$g'(t) = \frac{45(-2+t)^8}{(1+2t)^{10}}$$

Part (b)

Use Mathematica to differentiate the function in Example 6.

$$y' = 4(1+2x)^5(-1+3x^2)(1-x+x^3)^3 + 10(1+2x)^4(1-x+x^3)^4$$

Use Mathematica's Simplify command.

$$y' = 2(1+2x)^4(1-x+x^3)^3(3-9x+6x^2+17x^3)$$

Using Mathematica's Factor command gives the same result. The factored form is best for locating horizontal tangents.