CALCULUS
Implicit differentiation
OLD2

0430-1. OLD2 Let an expression y of x be given, implicitly, by the formula $xy - 4x - 7x^4 = 5$.

a. Find dy/dx by implicit differentiation.

b. Solve for y as an explicit expression of x.

c. Differentiate your answer to Part b, writing dy/dx as an explicit expression of x.

d. Substitute your answer for Part b into every y appearing in your answer to Part a, writing dy/dx as an explicit expression of x.

e. Verify that your answers to Part c and Part d are the same.

0430-2. Let an expression y of x be given, implicitly, by the formula $x^5 + y^5 = 1$.

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a. Find dy/dx by implicit differentiation.

b. Solve for y as an explicit expression of x.

c. Differentiate your answer to Part b, writing dy/dx as an explicit expression of x.

d. Substitute your answer for Part b into every y appearing in your answer to Part a, writing dy/dx as an explicit expression of x.

e. Verify that your answers to Part c and Part d are the same.

0430-3. OLD2 Let an expression y of x be given, implicitly, by the formula

$$xe^y - \tan y + 2e^x \cos y = 2.$$

Find dy/dx by implicit differentiation.

0430-4. OLD2 Let an expression y of x be given, implicitly, by the formula

$$\cos y = 3x - y - 2.$$

Find dy/dx by implicit differentiation.

0430-5. OLD2 Let an expression y of x be given, implicitly, by the formula

$$x^4 + y^4 = 17.$$

Find an equation of the tangent line to the graph of this equation at the point $(2, 1)$.

0430-6. OLD2 Let an expression y of x be given, implicitly, by the formula

$$y^2 = 6x^4 - 2x^2.$$

Find an equation of the tangent line to the graph of this equation at the point $(-1, -2)$.

0430-7. OLD2 Let an expression y of x be given, implicitly, by the formula

$$3x^5 - y^5 + xy = 8.$$

Find d^2y/dx^2 by implicit differentiation.

0430-8. OLD2 Let an expression y of x be given, implicitly, by the formula

$$2\sqrt{2}x^2 + y^5 = 6 + xy.$$

Find d^2y/dx^2 by implicit differentiation.

0430-9. For every $a \in \mathbb{R}$, for every $b > 0$,
OLD2
let G_a be graph of the equation $y = ax^7$ and
let H_b be graph of the equation $x^2 + 7y^2 = b$.

a. Let p be the point $(1, 1)$, which lies both on G_1 and on H_8.

Show that the tangent lines to G_1 and H_8 at p are perpendicular.

b. Let a and b be any two real numbers, with $b > 0$.

Let q be any point which lies both on G_a and on H_b.

Show that the tangent lines to G_a and H_b at q are perpendicular.

Challenge problem (not assigned):

N/A

For every $a, b \in \mathbb{R}$,

let G_a be graph of $x - 2y = 2axy$ and

let H_b be graph of $x^3 + 2y^3 = b$.

a. Let p be the point $(2, 1)$, which lies both on G_0 and on H_{10}.

Show that the tangent lines to G_0 and H_{10} at p are perpendicular.

b. Let a and b be any two real numbers.

Let q be any point which lies both on G_a and on H_b.

Show that the tangent lines to G_a and H_b at q are perpendicular.