WHAT DOES FUNCTION f(x)=2x CALL HER MOTHER'S SISTER F(x)=x²?

An equation involving derivatives is referred to as a **differential equation**.

If $f'(x) = 4x^3$, a solution to this equation is $f(x) = x^4$, in fact there are an infinite number of solutions. Any function of the form $f(x) = x^4 + k$, where k is any constant, is a solution. $\therefore$ $f(x) = x^4 + k$ is called the **general solution** to the **differential equation** $f'(x) = 4x^3$.	If $f'(x) = 4x^3$ and $f(2) = 10$, then $f(x) = x^4 + k$ $f(2) = 2^4 + k$ $10 = 16 + k,\ k = -6$ $\therefore$ $f(x) = x^4 - 6$ $f(x) = x^4 - 6$ is called a **particular solution** to the **differential equation** $f'(x) = 4x^3$ with **initial condition** $f(2) = 10$.

Match each derivative f'(x) with a function f(x) below.

1) $f'(x) = 2x - 1$	2) $f'(x) = 3x^2 - 1$	3) $f'(x) = 3$	4) $f'(x) = x^2 - x + 1$
5) $f'(x) = 5x^4 - 4x^3$	6) $f'(x) = x^4 - 4x + 5$	7) $f'(x) = 2x^4 - 2x^2$	8) $f'(x) = -x^{-2}$
9) $f'(x) = \frac{1}{2}x^{-1/2}$	10) $f'(x) = \frac{1}{3}x^{-2/3}$	11) $f'(x) = \frac{1}{2\sqrt{x}}$	12) $f'(x) = -\frac{1}{x^2}$

Functions (anti-derivatives).

A. $f(x) = 3x + k$	B. $f(x) = x^3 + k$	D. $f(x) = x^2 - x + k$	E. $f(x) = \frac{1}{x} + k$
F. $f(x) = \frac{1}{2}\sqrt{x} + k$	H. $f(x) = \sqrt[3]{x} + k$	I. $f(x) = \sqrt{x} + k$	N. $f(x) = x^3 - x + k$

R. $f(x) = x^5 - x^4 + k$	S. $f(x) = \frac{1}{3}x^2 - \frac{1}{2}x + k$	T. $f(x) = \frac{1}{3}x^3 - \frac{1}{2}x^2 + x + k$
U. $f(x) = \frac{1}{5}x^5 - 2x^2 + 5x + k$	V. $f(x) = \frac{2}{5}x^5 - \frac{2}{3}x^3 + k$	W. $f(x) = \frac{2}{5}x^5 - 2x^3 + k$

Match each differential equation that satisfies the given initial condition with a function below.

13) $f'(x) = 2x + 2,\ f(0) = 7$	14) $f'(x) = 2x + 2,\ f(1) = 7$	15) $f'(x) = 3x^2 - 3,\ f(0) = -1$
16) $f'(x) = x^4 - x^2,\ f(1) = 0$	17) $f'(x) = x^{-3} - \frac{1}{8},\ f(2) = -1$	18) $f'(x) = \frac{3}{2}\sqrt{x},\ f(4) = 4$

Particular solution to differential equations.

A. $f(x) = x^3 - 3x - 1$	E. $f(x) = x^2 + 2x + 4$	G. $f(x) = x^2 + 2x$
H. $f(x) = x^3 - 3x$	I. $f(x) = x^2 + 2x + 7$	R. $f(x) = x\sqrt{x} - 4$
T. $f(x) = -\frac{1}{2x^2} - \frac{x}{8} - \frac{5}{8}$	V. $f(x) = \frac{1}{5}x^5 - \frac{1}{3}x^3 + \frac{2}{15}$	Z. $f(x) = \frac{1}{5}x^5 - \frac{1}{3}x^3$

10	14	5							
3	6	2	4	11	14				
1	12	18	13	16	15	17	9	7	8