- Assignment 10 due on April 8
- Test 5 opens on April 22

- Today: Taylor series **(Videos 14.5, 14.6)**
- Wednesday: Analytic functions (Videos 14.7, 14.8)
- Friday: no class (Good Friday)
- Next week: Profit!

# Competition!

- Do you prefer cats or dogs? You MUST choose one. Now you are in the $C$-team or the $D$-team.
- Copy only one polynomial ($C$ or $D$):

$$C(x) = -\frac{293}{8} + 29x + \frac{13}{4}x^2 - 3x^3 + \frac{3}{8}x^4$$

$$D(x) = 29 + 8(x-3) - \frac{7}{2}(x-3)^2 + \frac{9}{6}(x-3)^3 + \frac{9}{24}(x-3)^4$$

- I will ask you questions.
  Answer only about your polynomial ($C$ or $D$).
  **No calculators!**

# Competition!

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$$D(x) = 29 + 8(x-3) - \frac{7}{2}(x-3)^2 + \frac{9}{6}(x-3)^3 + \frac{9}{24}(x-3)^4$$

$C$-team compute...

0. $C(3)$
1. $C'(3)$
2. $C''(3)$
3. $C'''(3)$
4. $C^{(4)}(3)$

$D$-team compute...

0. $D(3)$
1. $D'(3)$
2. $D''(3)$
3. $D'''(3)$
4. $D^{(4)}(3)$

Simplify your answers (write them as rational numbers)

**No calculators!**

# I spy a polynomial with my little eye

I'm thinking of a cubic polynomial $P$. It satisfies

$$P(1) = 8, \quad P'(1) = -\pi, \quad P''(1) = 4, \quad P'''(1) = \sqrt{7}$$

What is $P(x)$?

# A new Maclaurin series

Let $f(x) = \dfrac{1}{\sqrt{1+x}}$.

1. Find a formula for its derivatives $f^{(n)}(x)$.

   *Note:* Leave the coefficients factored (do not multiply them).
   You may find the "double factorial" notation useful:

   $$7!! = 7 \cdot 5 \cdot 3 \cdot 1, \qquad 8!! = 8 \cdot 6 \cdot 4 \cdot 2$$

2. Write its Maclaurin series at 0. Call it $S(x)$.
   Use sigma notation, and write out the first few terms explicitly as well.

   *Note:* It may be useful to separate the 0-th order term and not include it in the "sigma".

3. What is the radius of convergence of series $S(x)$?

# arcsin

You may use without proof that for every $x \in (-1, 1)$,
$f(x) = \dfrac{1}{\sqrt{1+x}} = S(x)$, which you just computed.

4. Write $h(x) = \arcsin x$ as a power series centered at 0.

   *Hint:* Compute $h'(x)$ and relate it to $f(x)$. Then integrate.

5. What is $h^{(137)}(0)$?