What is Computing Science?

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Who?

What?

When?

Where?

Why?

How?

How?

- How can we make things
  - Faster?
  - Better?
  - More efficient?
  - More accurate?
  - More secure?

What is a Computer?

How did they do it?

$$e^x = 1 + \cfrac{x}{1 - \cfrac{x}{x + 2 - \cfrac{2x}{x + 3 - \cfrac{3x}{x + 4 - \cfrac{4x}{x + 5 - \cfrac{5x}{x + 6 - \ddots}}}}}}.$$

$$\sin\frac{11\pi}{60} = \sin 33^\circ$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$\phi = -\sum_{k=1}^{\infty} \frac{\varphi(k)}{k} \log\left(1 - \frac{1}{\phi^k}\right)$$

14	Sinus	Tangens	Secans
31	2506616	2589280	10329781
32	2509432	2592384	10330559
33	2512248	2595488	10331339
34	2515063	2598593	10332119
35	2517879	2601699	10332901
36	2520694	2604805	10333683
37	2523508	2607911	10334467
38	2526323	2611018	10335251
39	2529137	2614126	10336037
40	2531952	2617234	10336823
41	2534766	2620342	10337611
42	2537579	2623451	10338399
43	2540393	2626560	10339188
44	2543206	2629670	10339979
45	2546019	2632780	10340770
46	2548832	2635891	10341563
47	2551645	2639002	10342356
48	2554458	2642114	10343151
49	2557270	2645226	10343946
50	2560082	2648339	10344743
51	2562894	2651452	10345540
52	2565705	2654566	10346338
53	2568517	2657680	10347138
54	2571328	2660794	10347938
55	2574139	2663909	10348740
56	2576950	2667025	10349542
57	2579760	2670141	10350346
58	2582570	2673257	10351150
59	2585381	2676374	10351955
60	2588190	2679492	10352762

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	Sinus	Tangens	Secans
29	9680748	38020782	39894421
28	9680018	38574537	39849654
27	9679288	38528396	39804991
26	9678557	38482358	39760431
25	9677825	38436424	39715975
24	9677092	38390591	39671621
23	9676358	38344861	39627369
22	9675624	38299233	39583219
21	9674888	38253707	39539171
20	9674152	38208281	39495224
19	9673415	38162957	39451379
18	9672678	38117733	39407633
17	9671939	38072609	39363988
16	9671200	38027585	39320443
15	9670459	37982661	39276997
14	9669718	37937835	39233651
13	9668977	37893109	39190403
12	9668234	37848481	39147254
11	9667490	37803951	39104203
10	9666746	37759519	39061250
9	9666001	37715185	39018395
8	9665255	37670947	38975637
7	9664508	37626807	38932976
6	9663761	37582763	38890411
5	9663012	37538815	38847943
4	9662263	37494963	38805570
3	9661513	37451207	38763293
2	9650762	37407546	38721112
1	9660011	37363980	38679025
0	9659258	37320508	38637033

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John Napier (log) and Jacob Bernoulli (e)

Taylor Series

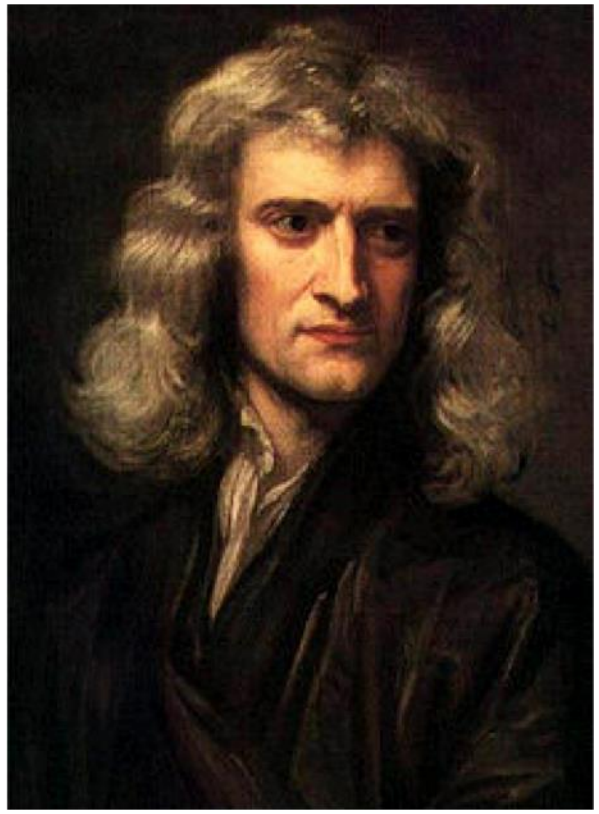
$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!} = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots$$

$$\sin x = \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} x^{2n+1} = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots$$

$$\frac{e^x}{\cos x} = 1 + x + x^2 + \frac{2x^3}{3} + \frac{x^4}{2} + \cdots.$$

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_2 x^2 + a_1 x + a_0$$

Divided Differences



$P(x) = 2x^2 - 4x + 3$

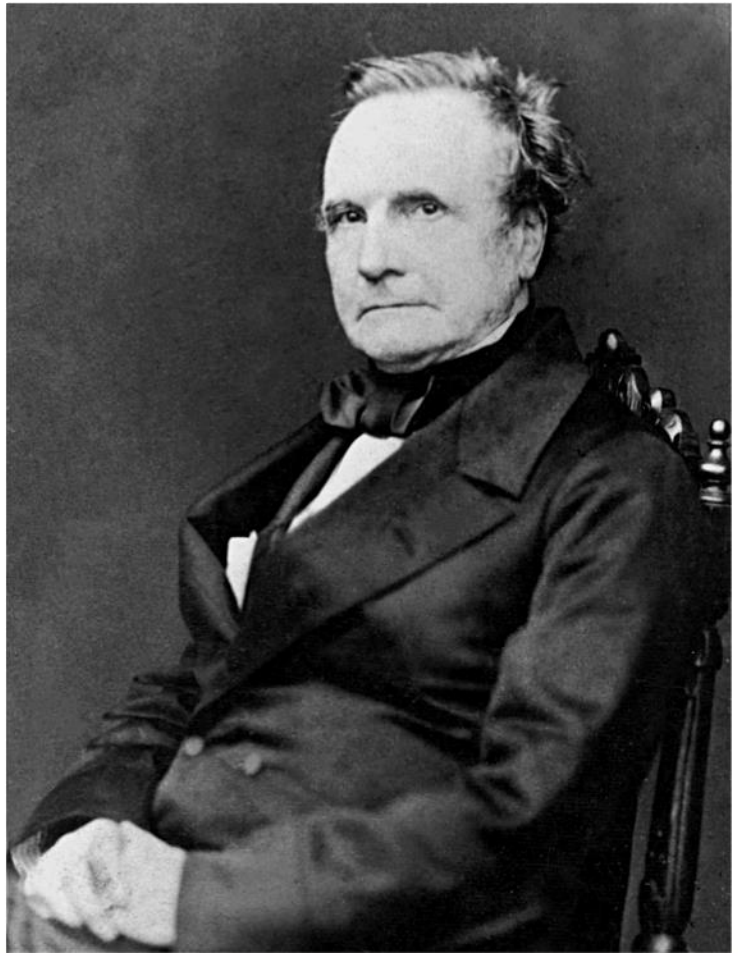
x	P(x)	D1(x) = P(x+1) - P(x)	D1(x+1) - D1(x)
0	3	-2	4
1	1	2	
2	3		
3			
4			
5			

Divided Differences

$P(x) = 2x^2 - 4x + 3$

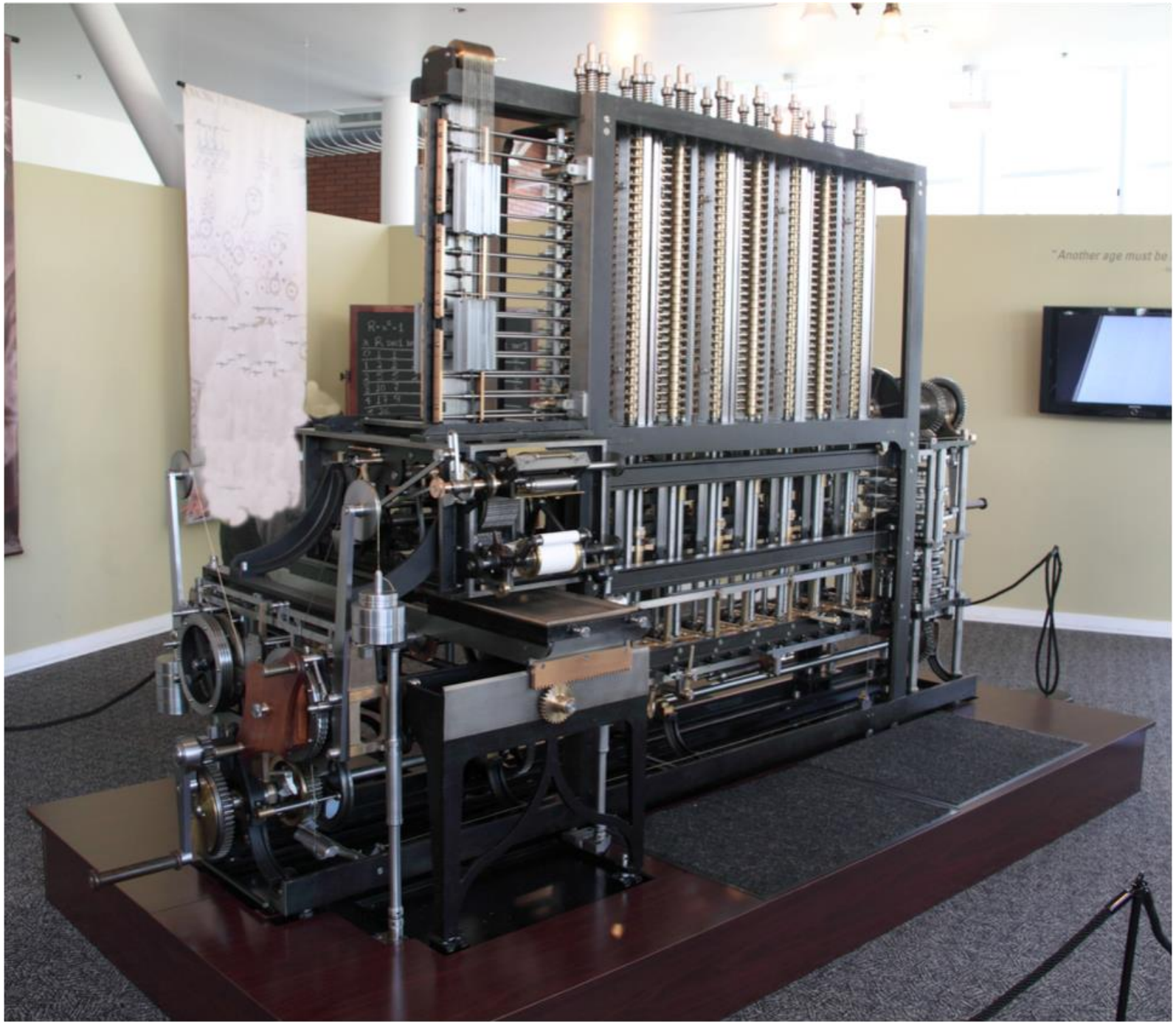
x	P(x)	D1(x) = P(x+1) - P(x)	D1(x+1) - D1(x)
0	3	-2	4
1	1	2	4
2	3	6	4
3	9	10	4
4	19	14	
5	33		

Charles Babbage

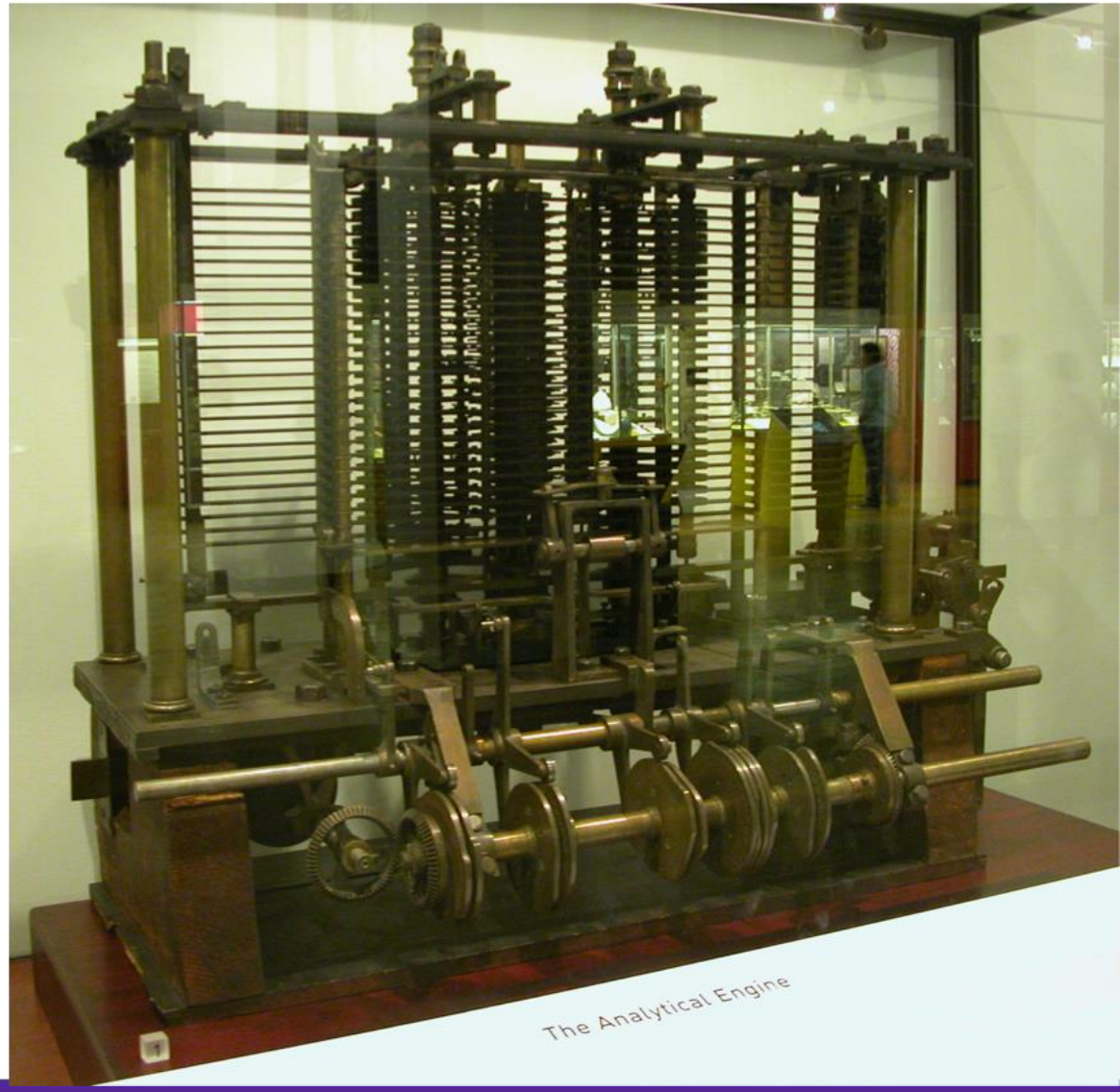


Difference Engine

Difference Engine

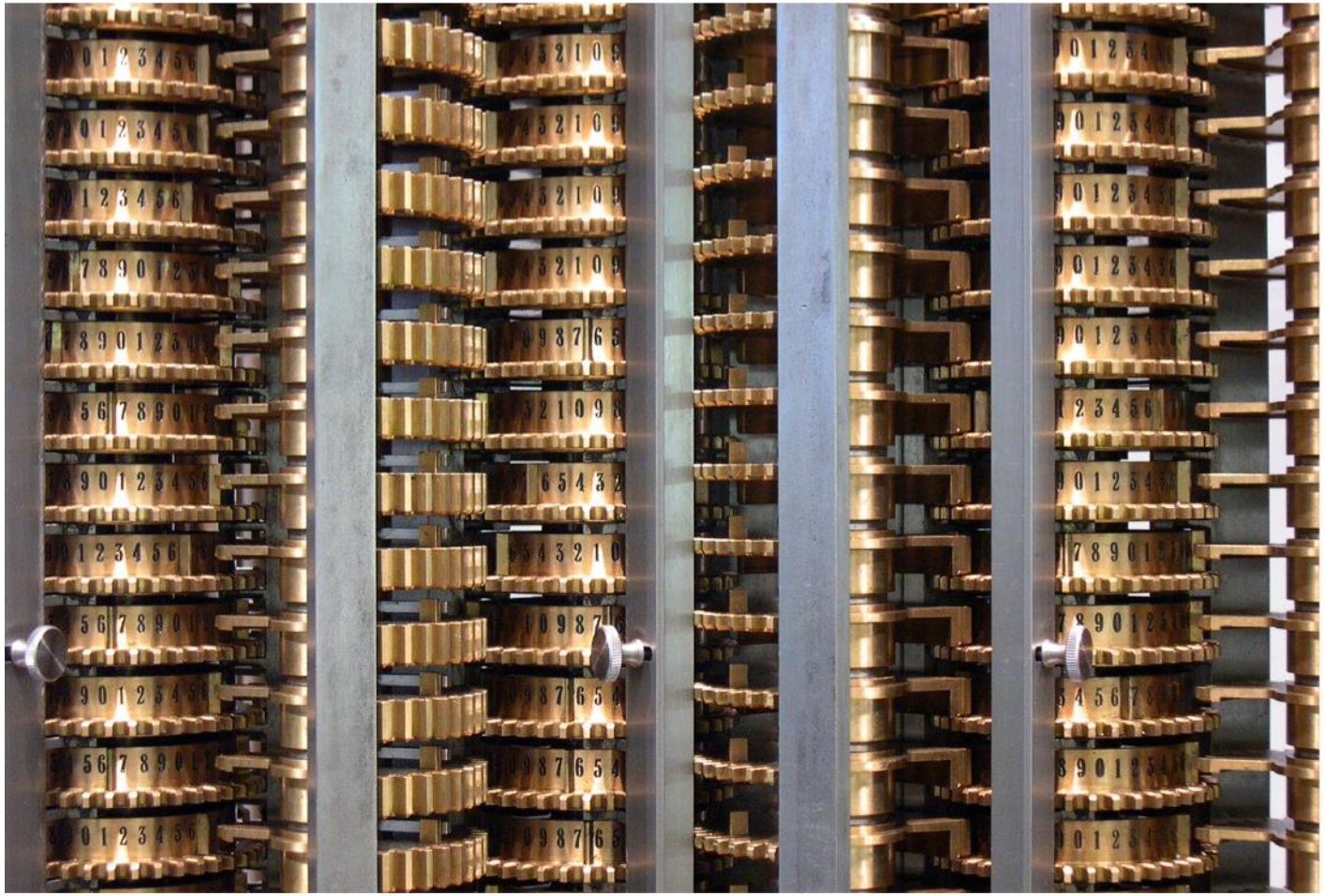


Analytical Engine



Input Cards and the Mill

The Store



The Father of Modern Computing