

```
Coins = (1 + p t + p^2 t^2 + p^3 t^3) (1 + n t + n^2 t^2) (1 + d t) (1 + q t) (1 + h t)
(1 + d t) (1 + h t) (1 + q t) (1 + n t + n^2 t^2) (1 + p t + p^2 t^2 + p^3 t^3)
```

```
Collect[Expand[Coins], t]
```

```
1 + (d + h + n + p + q) t + (d h + d n + h n + n^2 + d p + h p + n p + p^2 + d q + h q + n q + p q) t^2 +
(d h n + d n^2 + h n^2 + d h p + d n p + h n p + n^2 p + d p^2 + h p^2 +
n p^2 + p^3 + d h q + d n q + h n q + n^2 q + d p q + h p q + n p q + p^2 q) t^3 +
(d h n^2 + d h n p + d n^2 p + h n^2 p + d h p^2 + d n p^2 + h n p^2 + n^2 p^2 + d p^3 + h p^3 + n p^3 + d h n q +
d n^2 q + h n^2 q + d h p q + d n p q + h n p q + n^2 p q + d p^2 q + h p^2 q + n p^2 q + p^3 q) t^4 +
(d h n^2 p + d h n p^2 + d n^2 p^2 + h n^2 p^2 + d h p^3 + d n p^3 + h n p^3 + n^2 p^3 + d h n^2 q + d h n p q +
d n^2 p q + h n^2 p q + d h p^2 q + d n p^2 q + h n p^2 q + n^2 p^2 q + d p^3 q + h p^3 q + n p^3 q) t^5 +
(d h n^2 p^2 + d h n p^3 + d n^2 p^3 + h n^2 p^3 + d h n^2 p q + d h n p^2 q + d n^2 p^2 q +
h n^2 p^2 q + d h p^3 q + d n p^3 q + h n p^3 q + n^2 p^3 q) t^6 +
(d h n^2 p^3 + d h n^2 p^2 q + d h n p^3 q + d n^2 p^3 q + h n^2 p^3 q) t^7 + d h n^2 p^3 q t^8
```

```
p = 1; n = 1; d = 1; q = 1; h = 1; Collect[Expand[Coins], t]
```

```
1 + 5 t + 12 t^2 + 19 t^3 + 22 t^4 + 19 t^5 + 12 t^6 + 5 t^7 + t^8
```

```
Rico = (x + y)^8
```

```
(x + y)^8
```

```
Expand[Rico]
```

```
x^8 + 8 x^7 y + 28 x^6 y^2 + 56 x^5 y^3 + 70 x^4 y^4 + 56 x^3 y^5 + 28 x^2 y^6 + 8 x y^7 + y^8
```

```
p = 1
```

```
1
```

```
(1 + p t + p^2 t^2 + ... + p^8 t^8)
```



```
this doesn't seem to work - darn!
```

```
Table[p^n t^n, {n, 0, 8}]
```

```
{1, t, t^2, t^3, t^4, t^5, t^6, t^7, t^8}
```

```
this still didn't work - it thinks p is still = 1
```

```
Clear[p, n, d, q, h]
```

```
Table[p^n t^n, {n, 0, 8}]
```

```
{1, p t, p^2 t^2, p^3 t^3, p^4 t^4, p^5 t^5, p^6 t^6, p^7 t^7, p^8 t^8}
```

```
Sum[p^n t^n, {n, 0, 8}]
```

```
1 + p t + p^2 t^2 + p^3 t^3 + p^4 t^4 + p^5 t^5 + p^6 t^6 + p^7 t^7 + p^8 t^8
```

```
Sum[p^i t^i, {i, 0, 8}]
```

```
1 + p t + p^2 t^2 + p^3 t^3 + p^4 t^4 + p^5 t^5 + p^6 t^6 + p^7 t^7 + p^8 t^8
```

```
Sum[p^i t^i, {i, 0, 8}] Sum[n^i t^i, {i, 0, 8}]
Sum[d^i t^i, {i, 0, 8}] Sum[q^i t^i, {i, 0, 8}] Sum[h^i t^i, {i, 0, 8}]
(1 + d t + d^2 t^2 + d^3 t^3 + d^4 t^4 + d^5 t^5 + d^6 t^6 + d^7 t^7 + d^8 t^8)
(1 + h t + h^2 t^2 + h^3 t^3 + h^4 t^4 + h^5 t^5 + h^6 t^6 + h^7 t^7 + h^8 t^8)
(1 + n t + n^2 t^2 + n^3 t^3 + n^4 t^4 + n^5 t^5 + n^6 t^6 + n^7 t^7 + n^8 t^8)
(1 + p t + p^2 t^2 + p^3 t^3 + p^4 t^4 + p^5 t^5 + p^6 t^6 + p^7 t^7 + p^8 t^8)
(1 + q t + q^2 t^2 + q^3 t^3 + q^4 t^4 + q^5 t^5 + q^6 t^6 + q^7 t^7 + q^8 t^8)
Expand[Sum[p^i t^i, {i, 0, 8}] Sum[n^i t^i, {i, 0, 8}]
Sum[d^i t^i, {i, 0, 8}] Sum[q^i t^i, {i, 0, 8}] Sum[h^i t^i, {i, 0, 8}]]
```

```
Expand[(Sum[t^i, {i, 0, 8}])^5]
```

```
1 + 5 t + 15 t^2 + 35 t^3 + 70 t^4 + 126 t^5 + 210 t^6 + 330 t^7 + 495 t^8 + 710 t^9 + 976 t^10 + 1290 t^11 +
1645 t^12 + 2030 t^13 + 2430 t^14 + 2826 t^15 + 3195 t^16 + 3510 t^17 + 3750 t^18 + 3900 t^19 + 3951 t^20 +
3900 t^21 + 3750 t^22 + 3510 t^23 + 3195 t^24 + 2826 t^25 + 2430 t^26 + 2030 t^27 + 1645 t^28 + 1290 t^29 +
976 t^30 + 710 t^31 + 495 t^32 + 330 t^33 + 210 t^34 + 126 t^35 + 70 t^36 + 35 t^37 + 15 t^38 + 5 t^39 + t^40
```

```
Expand[(Sum[t^i, {i, 0, 9}])^5]
```

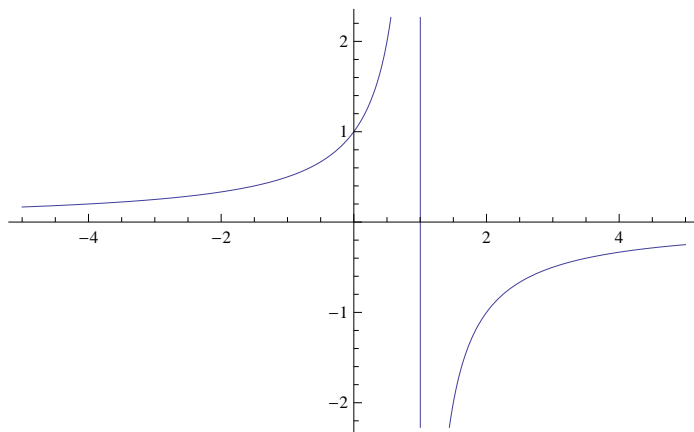
```
1 + 5 t + 15 t^2 + 35 t^3 + 70 t^4 + 126 t^5 + 210 t^6 + 330 t^7 + 495 t^8 + 715 t^9 + 996 t^10 +
1340 t^11 + 1745 t^12 + 2205 t^13 + 2710 t^14 + 3246 t^15 + 3795 t^16 + 4335 t^17 + 4840 t^18 +
5280 t^19 + 5631 t^20 + 5875 t^21 + 6000 t^22 + 6000 t^23 + 5875 t^24 + 5631 t^25 + 5280 t^26 +
4840 t^27 + 4335 t^28 + 3795 t^29 + 3246 t^30 + 2710 t^31 + 2205 t^32 + 1745 t^33 + 1340 t^34 +
996 t^35 + 715 t^36 + 495 t^37 + 330 t^38 + 210 t^39 + 126 t^40 + 70 t^41 + 35 t^42 + 15 t^43 + 5 t^44 + t^45
```

```
Expand[(Sum[t^i, {i, 0, Infinity}])^5]
```

$$\frac{1}{(1-t)^5}$$

Wait, this is a mighty curious result - to be continued, in class!

```
Plot[1 / (1 - x), {x, -5, 5}]
```



```
Plot[{1 / (1 - x), 1 + x + x^2 + x^3 + x^4 + x^5 + x^6}, {x, -0, 1}]
```

