$\mathbb{R}^3$

z

y

x

$P_n(x)$

... $x^2 + 5$ ...

... $2x^2 + 2x + 1$ ...

1 x x^2

... $1 + x$ ...

... $x^2 + 2x$ ...

We can specify a linear transformation from $\mathbb{R}^3$ to the polynomial vector space $P_3(x)$ by specifying where we send the basis elements. Here, we color code where we send the basis.