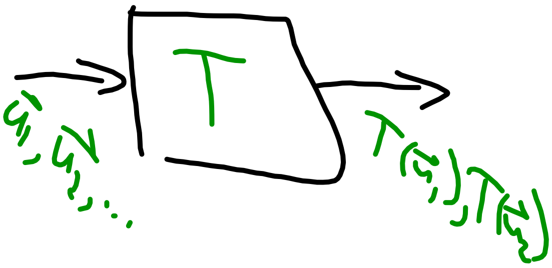
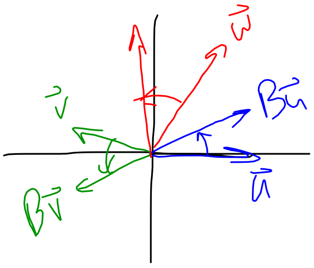
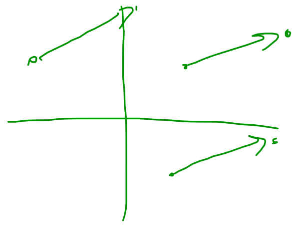
(13) $S(2x^2-5x+2) = -2.5x^2-7.5x+36.5$

(14) $T\left(\begin{bmatrix}7\\2\\-5\end{bmatrix}\right) = \begin{bmatrix}30\\11\\-22\end{bmatrix}$





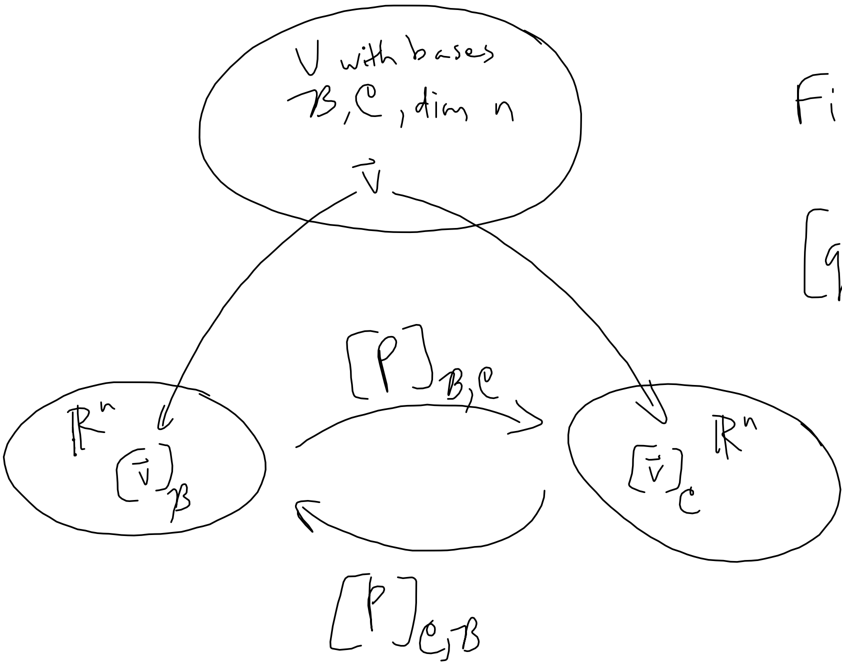

$$B = \begin{bmatrix} \frac{\sqrt{3}}{2} & -\frac{1}{2} \\ \frac{1}{2} & \frac{\sqrt{3}}{2} \end{bmatrix}$$



Not linear

# Exam

* Change of basis, coordinate vector
* Something like 2.1: 12, 13, 14
* Prove a subspace, counterexample for not
* Prove T is linear, counterexample for not
* Apply a given diff operator
* "Easy diff operator"




Find $[q(x)]_{\mathcal{B}}$

$[q(x)]_{\mathcal{B}} =$

$$[P]_{\mathcal{B},\mathcal{C}} = \begin{bmatrix} \quad & \quad \end{bmatrix}\begin{bmatrix} \quad \end{bmatrix} = \begin{bmatrix} \quad \end{bmatrix}$$

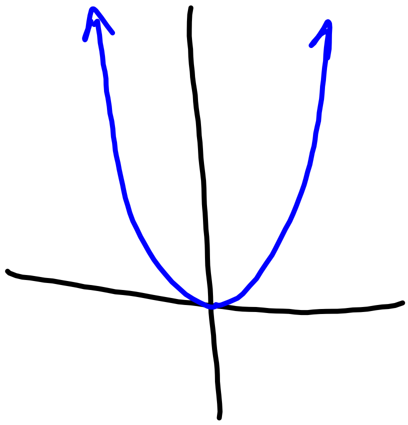
$$[P]_{\mathcal{B},\mathcal{C}}[q(x)]_{\mathcal{B}} \stackrel{?}{=} [q(x)]_{\mathcal{C}}$$

$$T(A+B) = \sim = \sim =$$

$$T(A)+T(B) = \sim = \sim =$$

$$T(A+B) \neq T(A)+T(B)$$

**Model** $f:\mathbb{R}\to\mathbb{R}$ is $f(x)=x^2$



* is not **onto**, because we don't get every $y$ here
* is not one-to-one because two different $x$'s can give the same $y$.

Define $f : \mathbb{R} \to [0, \infty)$ by $f(x) = x^2$

$f$ is onto, but still not one-to-one.

Define $f : [0, \infty) \to [0, \infty)$ by $f(x) = x^2$

$f$ is onto and one-to-one.

$T: \mathcal{P}_2 \longrightarrow \mathcal{P}_2$ defined by $[T(p)](x) = p'(x)$

$p(x) = x^2 + 2x + 3$ $\quad p'(x) = 2x + 2$

$q(x) = x^2 + 2x + 4$ $\quad q'(x) = 2x + 2$

$T$ is not one-to-one, or onto

$T: P_2 \to P_1$ is onto.

Let $q \in P_1$. Then $q(x) = ax + b$. Let $p(x) = \frac{a}{2}x^2 + bx$.

The $p'(x) = ax + b = q(x)$.

To get one-to-one, let $V = \{ax^2 + bx \mid a, b \in \mathbb{R}\}$