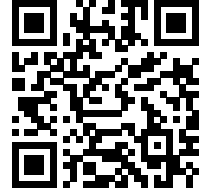


## Worksheet: L12 – Euclidean Transformation

CSCI-534: Robot Planning &amp; Manipulation

Spring 2020

<http://www.neil.dantam.name/rpm/B12-tf.pdf>

1. **Dual Number Transcendentals:** Simplify the following functions of dual numbers based on the Taylor series for dual numbers:

$$f(r + d\epsilon) \rightsquigarrow \left( f(r) + \frac{f'(r)}{1!}(d\epsilon) + \frac{f''(r)}{2!}(d\epsilon)^2 + \dots \right) \rightsquigarrow \left( f(r) + df'(r)\epsilon \right)$$

(a)  $\exp(r + d\epsilon) \rightsquigarrow$

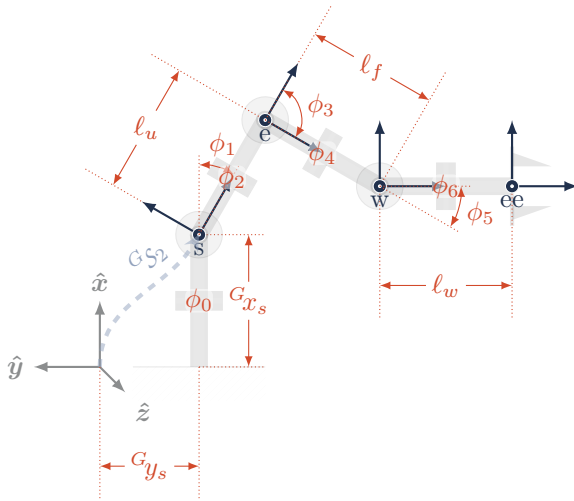
(b)  $\ln(r + d\epsilon) \rightsquigarrow$

(c)  $\cos(r + d\epsilon) \rightsquigarrow$

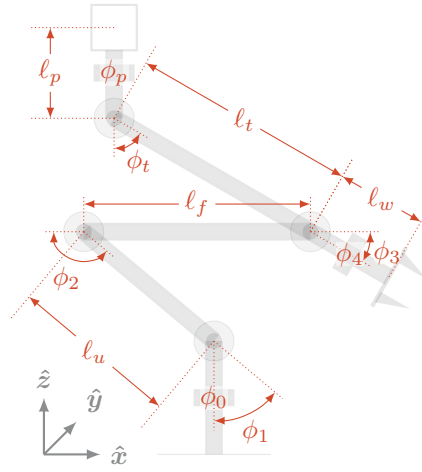
(d)  $\sin(r + d\epsilon) \rightsquigarrow$

(e)  $\sqrt{r + d\epsilon} \rightsquigarrow$

Name:



(a) Schunk LWA4



(b) EOD 510 Packbot

2. **Arm Kinematics:** Write the relative transforms for:

(a) The Schunk LWA4

(b) The EOD 510 Packbot