Linearize the following equation for $V \approx 13.89$ m/s

$$1908 \frac{dV}{dt} = F(t) - 171.4 - 0.36 V^2$$

$V = 13.89 + Ve$ where $|Ve| << 13.89$

$F = 280.86 + Fe$ where $|Fe| << 280.86$

Force in Newton

The value 280.86 comes from the operating point condition that $v = 13.89$ m/s and $dV/dt = 0$

$$0 = F - 171.4 - 0.36 \cdot 13.89^2$$

$$F = 280.86 \text{ Newton}$$

Substitute

$$1908 \frac{d}{dt}(13.89 + Ve) = 280.86 + Fe - 171.4 - 0.36(13.89 + Ve)^2$$

$$1908 \frac{d}{dt}(Ve) = \cancel{280.86} + Fe - \cancel{171.4} - \cancel{49.46} - 10 Ve - \underbrace{0.36 Ve^2}$$

Neglect since Ve is very small

$$\boxed{1908 \frac{d}{dt}(Ve) = Fe - 10 Ve}$$

As a transfer function

$$\frac{\overline{Ve}}{\overline{Fe}} = \frac{1}{1908 s + 10}$$