Problem Set 1

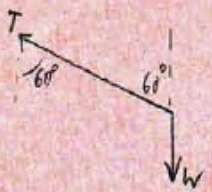
1.1) **Known**
$F = 30\ lbf$
$w = 10\ lbf$

$F - w = ma = (30-10)\,lbf = \left(\frac{10\ lbf}{32.2\ ft/s^2}\right) a$ $\boxed{a = 64.4\ ft/s^2}$

1.2) **Known**
$F = 30\ lbf$
$g = 5.31\ ft/s^2$

$F - w = ma$ $(30-1.65)\,lbf = \left(\frac{1.65\ lbf}{5.31\ ft/s^2}\right) a$ $\boxed{a = 91.23\ ft/s^2}$

1.3) **Known**
$L = 1m$
$m = 1kg$
$\theta = 60°$



$W = mg = 9.81\ m/s$ $\Sigma F_y = 0$ $T\cos 60 - W = 0$
$\boxed{T = 19.62N}$

$a = \frac{T}{m} = \frac{19.62N}{1kg} = 19.62\ m/s^2$ $r = L\sin 60 = 0.866m$

$a = \omega^2 r$ $\omega^2 = \frac{a}{r} = \frac{19.62 \sin 60}{0.866}$ $\omega = 4.43\ rad/s \cdot (rev/2\pi\ rad) \cdot (60s/min) = \boxed{42.3\ RPM}$

1.4) F, F, F, T 1.5) d

1.6)

psia	psig	psfa	psfg	kPa(a)	kPa(g)
14.696	0	2116.2	0	101.33	0
39.696	25	5716.2	3600	273.70	172.37
6.840	-7.856	985	-1131.2	47.16	-54.17
29.39	14.694	4232.2	2116	202.64	101.31
14.695	0.001	2116.1	0.1	101.32	0
14502.4	14503.7	2088751.4	208854352	10001.33	10^5

1.7) **Known**
$m = 3000kg$
$d = 0.25m$
$r = 0.125m$

$F = mg = (3000\ kg)(9.81\ m/s) = 29.43\ kN$ $A = \pi r^2 = 0.0491\ m^2$

$P = \frac{F}{A} = \frac{29.43\ kN}{0.0491\ m^2} = \boxed{600\ kPa}$