1) $k'_n = 400\ nA/v^2$ $V_t = .5v$ $\lambda = 0$ $\frac{W}{L} = 10$

$V_{DS} = 4v$ $V_{GS} = 4.4v$

Saturation Region

$V_{GS} > V_t$

$V_{DS} \geq V_{GS} - V_t$ → edge of saturation $V_{DS} = V_{GS} - V_t$

$i_D = \frac{1}{2} k'_n \frac{W}{L} (V_{GS} - V_t)^2$

$4.4 > .5$ → Saturation

$I_D = \frac{1}{2}(400)(10)(3.9)^2 = 30.42$

30420 nA

30420E-6

0.03042

Metric Prefix	Symbol	Multiplier (Traditional Notation)	Exponential	Description
Yotta	Y	1,000,000,000,000,000,000,000,000	10^{24}	Septillion
Zetta	Z	1,000,000,000,000,000,000,000	10^{21}	Sextillion
Exa	E	1,000,000,000,000,000,000	10^{18}	Quintillion
Peta	P	1,000,000,000,000,000	10^{15}	Quadrillion
Tera	T	1,000,000,000,000	10^{12}	Trillion
Giga	G	1,000,000,000	10^{9}	Billion
Mega	M	1,000,000	10^{6}	Million
kilo	k	1,000	10^{3}	Thousand
hecto	h	100	10^{2}	Hundred
deca	da	10	10^{1}	Ten
base	b	1	10^{0}	One
deci	d	1/10	10^{-1}	Tenth
centi	c	1/100	10^{-2}	Hundredth
milli	m	1/1,000	10^{-3}	Thousandth
micro	μ	1/1,000,000	10^{-6}	Millionth
nano	n	1/1,000,000,000	10^{-9}	Billionth
pico	p	1/1,000,000,000,000	10^{-12}	Trillionth
femto	f	1/1,000,000,000,000,000	10^{-15}	Quadrillionth
atto	a	1/1,000,000,000,000,000,000	10^{-18}	Quintillionth
zepto	z	1/1,000,000,000,000,000,000,000	10^{-21}	Sextillionth
yocto	y	1/1,000,000,000,000,000,000,000,000	10^{-24}	Septillionth

2) $k'_p = 50\ nA/v^2$ $V_{tp} = -1.5v$ $\lambda = 0$ $\frac{W}{L} = 10$

$V_{SD} = 1.5v$ $V_{SG} = 3.1v$

$i_D = k'_p \frac{W}{L} (V_{SG} - |V_{tp}|) V_{SD}$

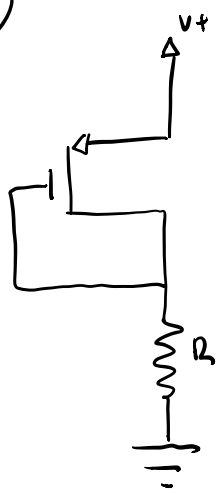
$I_D = (50)(10)(3.1 - 1.5)(1.5)$

$I_D = 1200E-6$ 1.2 mA

$V_{SG} > |V_{TP}|$

→ Triode

(3)



$V_t = -1.1v$

$k'_p = 500 \mu A/V^2$

$\frac{w}{L} = ID$

$I_D =$

$V_D = 1.9v = G$ $\quad V_{SG} = 3.5 - 1.9$

$V+ = 3.5$ $\quad V_{SG} = 1.6v$

$V_{SG} > |V_t|$

$1.6 > 1.1$

$i_D = k'_p \frac{w}{L} (V_{SG} - |V_{tp}|) V_{SD}$ $\quad I_D =$

$r_d = 1/k'_p \frac{w}{L} (V_{SG} - |V_{TP}|)$

?

$I_D = (500)(10)(0.5)(1.9)$

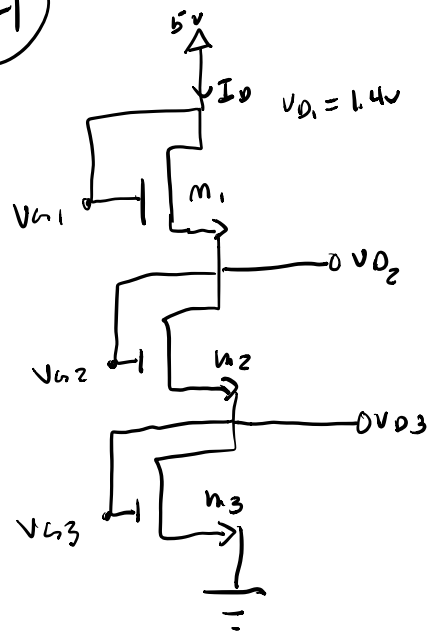
$I_D = 4.75 mA$

$r_d = 1/k'_p \frac{w}{L} (V_{SG} - |V_{TP}|)$

$R_D = \frac{1}{(500)(10)(0.5)}$ $\quad 10,000 \Omega$

$10 k\Omega$

L1



$V_t = 1V$

$N_n C_{ox} = 80nA$

$\lambda = 0$

$L = 1nm$

$$I_{D1} = \frac{1}{2} k'_n \left(\frac{W_1}{L_1}\right)(V_{GS1} - V_t)^2$$

$$.15 = \frac{1}{2}(80)\left(\frac{W_1}{1}\right)(1.4 - 1)^2$$

$$.30 = 12.8\, W_1$$

W_2

$$.15 = \frac{1}{2}(80)(W_1)(1.75 - 1)^2$$

?

$V_{GS2} =$