

EXP. NUMBER	EXPERIMENT/SUBJECT	DATE	25
NAME	LAB PARTNER	LOCKER/DESK NO.	COURSE & SECTION NO.

HW 3 Resubmission

1) want Q to raise lake level to $\phi_{av} + 1.5 \text{ m}$

$$\phi_1 = 24, \quad \phi_2 = 18 \text{ m},$$

$$\phi_0 = \phi_{av} + 1.5 = 1.5 + \sqrt{\frac{\phi_1 + \phi_2}{k}} = 22.7$$

$$\Phi_0 = 2576.45 \quad \text{from } \Phi = \frac{1}{2} k \phi^2$$

$$\Omega = -Q_{x0} \left(z - \frac{R^2}{z} \right) + \frac{Q}{2\pi} \ln \frac{z}{R} + \Phi_0$$

$$\text{at } z = L, \quad \text{Re}(\Omega) = 2880 = \Phi_1$$

$$\Phi_1 = -Q_{x0} \left(L - \frac{R^2}{L} \right) + \frac{Q_0}{2\pi} \ln \frac{L}{R} + \Phi_0$$

$$Q_0 = \left(\Phi_1 - \Phi_0 + Q_{x0} \left(L - \frac{R^2}{L} \right) \right) 2\pi \frac{1}{\ln \frac{L}{R}}$$

$$Q_0 = -907 \text{ m}^3/\text{d}$$

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NOTE: INSERT DIVIDER UNDER COPY SHEET BEFORE WRITING

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2) Use a well to maintain ϕ_0 , well within 200 m, Downstream head constant

$$\phi = -Q_{x0} \left(z - \frac{R^2}{z} \right) + \frac{Q}{2\pi} \ln \left(\frac{z - z_w}{z - \frac{R^2}{z_w}} \frac{R}{|z_w|} \right) + \phi_0$$

at $z = L$, $\phi(z) = \phi_2$

$$Q = \frac{\left(\phi_2 - \phi_0 + Q_{x0} \left(L - \frac{R^2}{L} \right) \right) 2\pi}{\ln \left(\frac{L - z_w}{L - \frac{R^2}{z_w}} \frac{R}{|L|} \right)}$$

for $z_w = R + 200$ $Q = 228.2 \text{ m}^3/\text{d}$

for $z_w = -R - 200$ $Q = 226.3 \text{ m}^3/\text{d}$

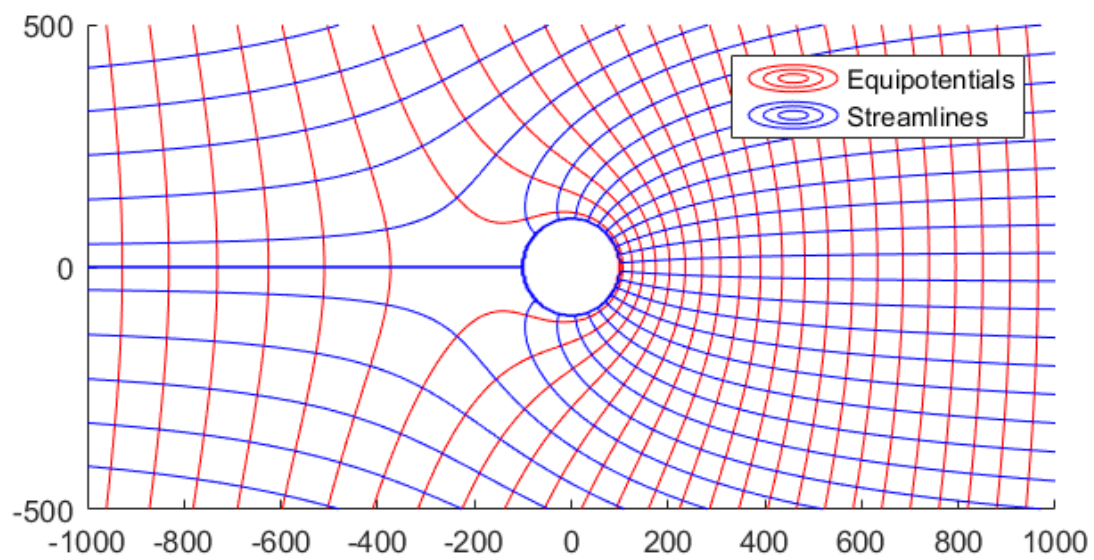
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3) Less pumping is required when the well is located upgradient of the lake. More pumping is required when the well is downstream of the lake because the downstream well pulls more from the lake. The upstream well captures less water from the lake because the gradient from the well to the lake is less in the upstream case than the downstream case. The flownet for the upstream well placement resembles the flownet for the lake without the well more than the downstream well placement's flownet.

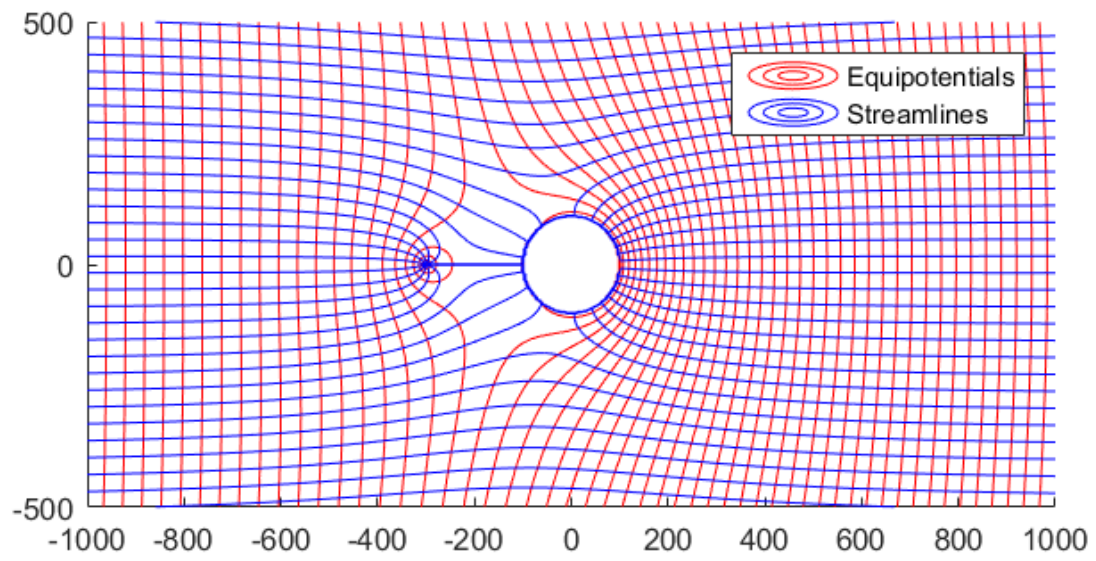
4)

Lake above aquifer level:

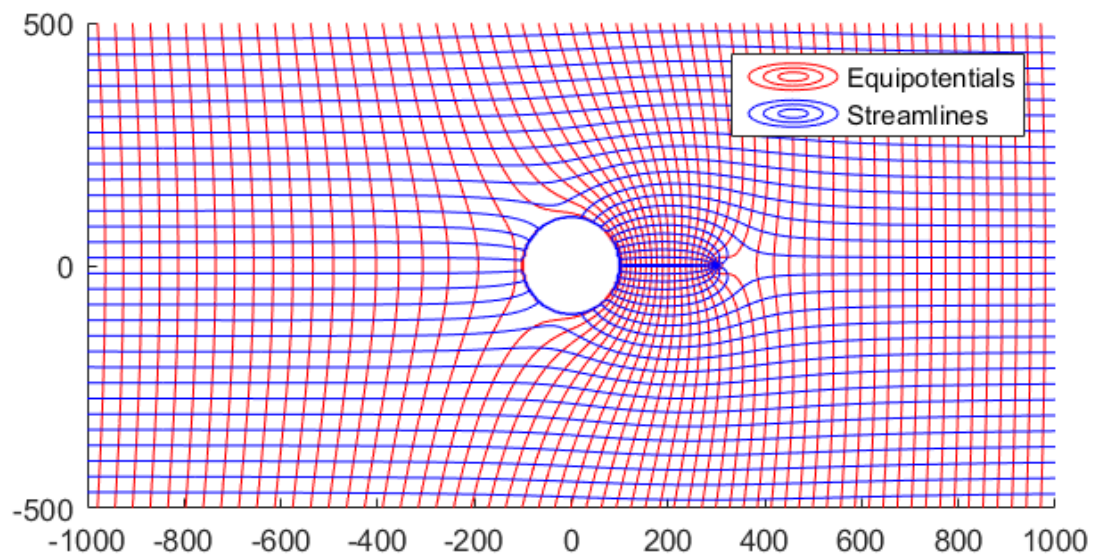
Upstream well



Upstream well:



Downstream well:



Code changes:

Runfile_1.m

```
Qx0 = 0.63;
Phi0= 2576.45;
rl= 100;
Phi1 = 2880
l = 1000
Phi2= 1620

Q= (Phi2 - Phi0 +Qx0*(1 - rl*rl/l) )*2* pi/log(1/rl)
ContourMe_flow_net(-1000,1000,500,-
500,500,500,@(z)omega_total1(z,Q,Qx0, Phi0, rl),30);
```

Runfile_2.m:

```
Qx0 = 0.63;
Phi0= 2576.45;
rl= 100;
Phi2 = 1620;

Phi1=2880;
l=1000;
zw =rl +200

Q=2*pi* (Phi2 - Phi0 + Qx0*(1+-
rl*rl/l))/real(log((rl/(l*conj(l)))*(1-zw)/(1-rl*l/conj(zw))))

ContourMe_flow_net(-1000,1000,500,-
500,500,500,@(z)omega_total2(z,zw,Q,Qx0, Phi0, rl),30);
```