1. a) K?

$$q = -K \frac{dh}{dx}$$

$$v = \frac{q}{n}$$

$$v = \frac{-K}{n} \frac{dh}{dx}$$

$$-\frac{v \cdot n}{dh/dx} = K$$

$$K = \frac{0.02\ m/d \cdot 0.35}{0.05}$$

$$K = 0.14\ m/d$$

$K =$ [redacted] $2 \cdot 10^{-6}\ m/s$

1 b) $$K = k\frac{\mu}{\rho g}$$

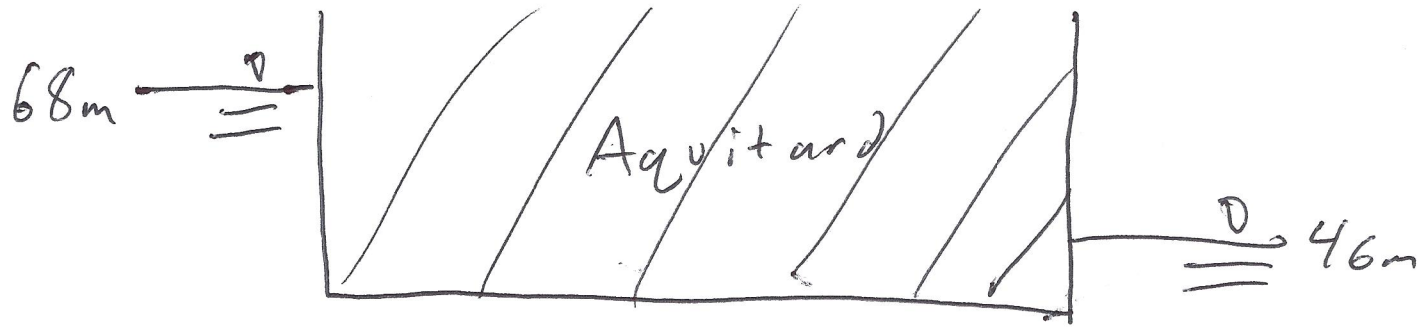
$$K = 2 \cdot 10^{-6}\ m/s \cdot \frac{1.002 \cdot 10^{-3}\ Pas}{998.2\ kg/m^3 \cdot 9.81\ m/s^2}$$

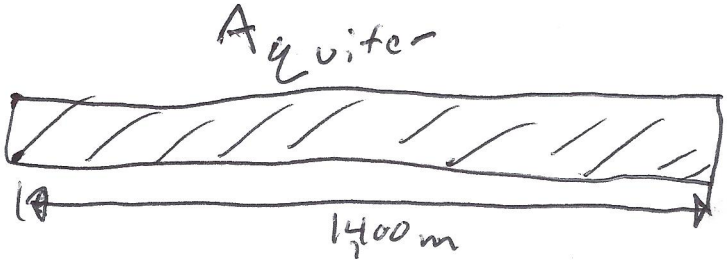
$$K = 2 \cdot 10^{-13}\ m^2$$

c) silty sand

accept most answers

2 a)





b) $q = -k \frac{dh}{dx}$

$q = -10^{-5} \text{ m/s} \cdot \frac{68\text{m} - 46\text{m}}{0 - 1{,}400\text{m}}$

$q = 2 \cdot 10^{-7} \text{ m/s}$

$\boxed{q = 0.01 \text{ m/d}}$

c) $Q = q \cdot A$

$Q = 0.01 \text{ m/d} \cdot 3{,}000 \text{ m}^2$

$\boxed{Q = 40 \text{ m}^3/\text{day}}$

d) $v = q/n = 0.02 \text{ m/d} / 0.30$

$\boxed{V = 0.05 \text{ m/d}}$

e) $t = L/V$

$t = \frac{1{,}400 \text{ m}}{0.05 \text{ m/d}}$

$\boxed{t = 84 \text{ years}}$

3a) $k = \frac{\sum b}{\sum \frac{b}{k}}$

$$\frac{400\ m}{\frac{100\ m}{2\cdot10^{-4}\ m/s} + \frac{100\ m}{6\cdot10^{-3}\ m/s} + \frac{100\ m}{3\cdot10^{-4}\ m/s} + \frac{100\ m}{8\cdot10^{-5}\ m/s}}$$

$$k = 1.9\cdot10^{-4}\ m/s$$

b)

$$q = -k\frac{dh}{dx}$$

$$q = 1.9\cdot10^{-4}\ m/s \cdot \frac{32-0}{400-0}$$

$$q = -1.5\cdot10^{-5}\ m/s$$

c) $$dh_1 = -\frac{q\cdot dx}{k_1}$$

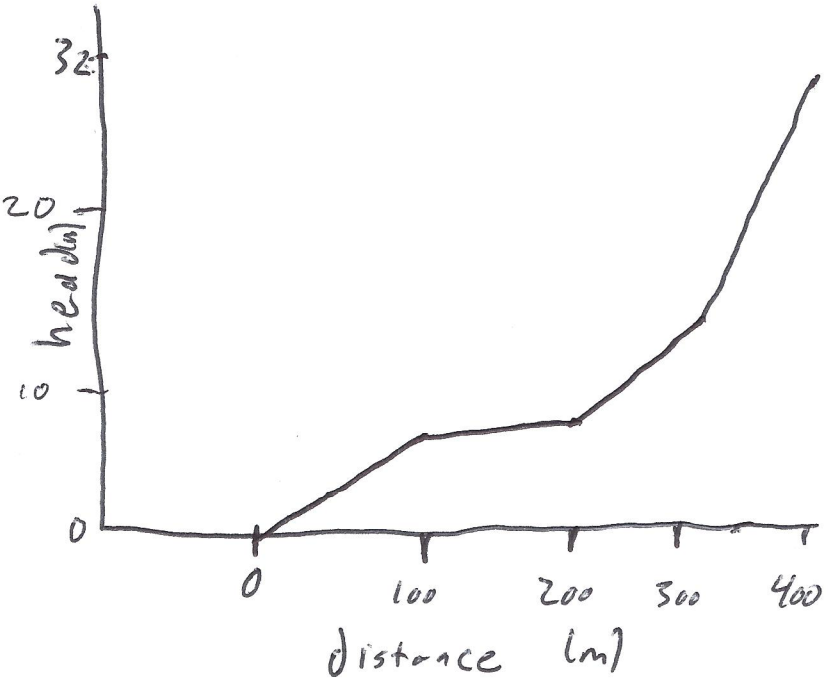
$$dh_1 = \frac{1.5\cdot10^{-5}\ m/s \cdot 100\ m}{2\cdot10^{-4}\ m/s}$$

$dh_1 = 7.5\ m$

$dh_2 = 0.25\ m$

$dh_3 = 5\ m$

$dh_4 = 18.75$



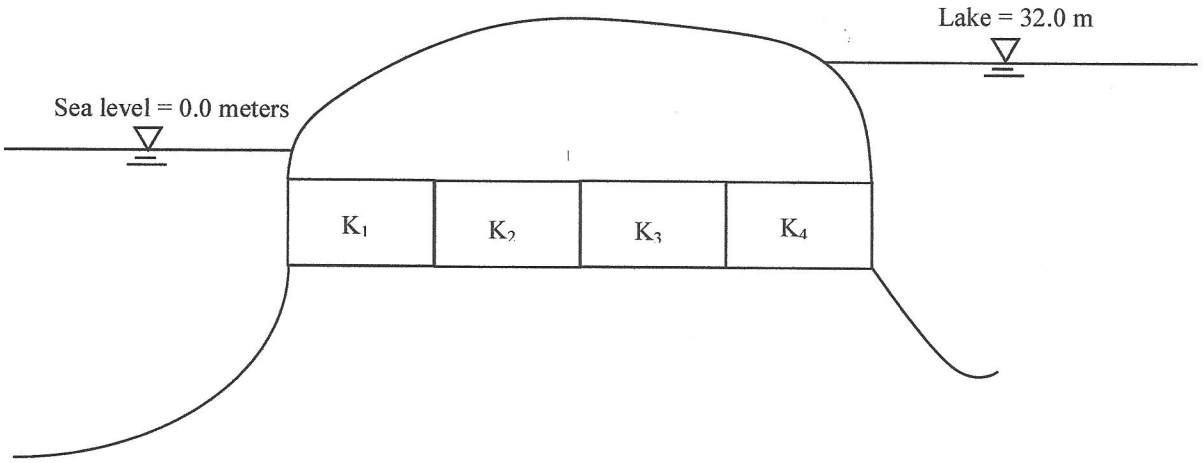


Figure 1

Question 4

Graphically determine the slope direction of the potentiometric surface from the hydraulic heads observed at the three wells illustrated in plan view bellow. Draw the hydraulic head and indicate flow direction with an arrow on the figure. (5 points)