3) Consider the weak base Dimehtylamine $(CH_3)_2NH$. What is the pH of 3.0M dimethylamine? Kb = 5.9 x 10 $^{-4}$. Assume that the amount of Dimethylamine that dissociates is small enough that it can be ignored to avoid the quadratic

	$(CH_3)_2NH$	+ H_2O	⇌ $(CH_3)_2NH_2^+$	+ OH^-
R				
I	3.0		–	–
C	$-x$		$+x$	$+x$
E	$3.0-x$		x	x

$$k_b = \frac{[(CH_3)_2NH_2^+][OH^-]}{(CH_3)_2NH}$$

$$5.9\times10^{-4} = \frac{x^2}{3.0-x}$$

← so small in comparison to 3.0 that $3.0-x \simeq 3.0$

$$5.9\times10^{-4} = \frac{x^2}{3.0}$$

$$0.042071367 = x = [OH^-]$$

$$[H_3O^+][OH^-] = k_w$$

$$[H_3O^+] = \frac{k_w}{[OH^-]}$$

$$[H_3O^+] = \frac{1.0\times10^{-14}}{0.042071367}$$

$$[H_3O^+] = 2.376913443\times10^{-13}$$

$$-\log[H_3O^+] = -\log(2.376913443\times10^{-13})$$

$$pH = 12.62$$

4) Will a solution of $NaHSO_3$ be acidic or basic? Show all calculations that lead to your conclusion.

acting as Acid

$$HSO_3^- + H_2O \rightleftharpoons H_3O^+ + SO_3^-$$

↑ produces H_3O^+ so acid

acting as base

$$HSO_3^- + H_2O \rightleftharpoons H_2SO_3 + OH^-$$

↑ produces OH^- so base

$$k_a\ HSO_3^- = 1.0\times10^{-7}$$

$$K_b\ HSO_3^- \times k_a\ H_2SO_3 = k_w$$

$$K_b\ HSO_3^- \times 1.5\times10^{-2} = 1.00\times10^{-14}$$

$$K_b\ HSO_3^- = \frac{1.00\times10^{-14}}{1.5\times10^{-2}}$$

$$K_b\ HSO_3^- = 6.7\times10^{-13}$$

$k_a > k_b$ so solution will be acidic