## Quiz for Lesson 13

Oct. 8, 2015 Electronic Circuits 1 Prof. Woo-Young Choi

Name: \_\_\_\_\_ Student ID: \_\_\_\_\_

## Prob. 1

Plot transconductance,  $g_m$ , of an NPN transistor in forward active region as a function of its collector current  $I_c$ . What is the numerical value of  $g_m$  in Siemens when  $I_c = 1$ mA and the transistor operates at room temperature?

## Prob. 2

In the circuit shown below, the collector saturation current for the transistor is  $1 \times 10^{-16}$ A,  $v_1 = 0$  V,  $V_{BE} = 750$ mV,  $R_C = 1$ K $\Omega$ ,  $V_{CC} = 3$ V. What is the output voltage,  $V_{out}$  at room temperature? Approximate exp(30) as  $1.0 \times 10^{13}$ .



## Prob. 3

In the same circuit shown above, now we have  $v_1 = v_0 \sin(\omega t)$  with  $v_0=1$ mV. Other conditions are same as in Prob. 2. What is the output voltage  $V_{out}(t)$ ? Approximate  $f(x+\Delta x)|_{x_0}$  with  $f(x_0) + f'(x_0)g\Delta x$  when  $x > \Delta x$ . What function does this circuit perform?