# STA 431 Quiz 1

1. (5 points) Let the random variable $x$ have expected value $\mu_x$, let the random variable $y$ have expected value $\mu_y$, and let $a$ be a non-zero constant. Circle one the of following statements and prove it, *using the definition of covariance* from the formula sheet.

$$Cov(ax, y) = a^2 Cov(x, y), \quad Cov(ax, y) = aCov(x, y), \quad Cov(ax, y) = Cov(x, y), \quad Cov(ax, y) = 0$$

2. (5 points) Let

$$y_1 = \alpha_1 + \beta_1 x + \epsilon_1$$
$$y_2 = \alpha_2 + \beta_2 x + \epsilon_2,$$

where $E(x) = \mu$, $Var(x) = \sigma_x^2$, $E(\epsilon_1) = E(\epsilon_2) = 0$, $Var(\epsilon_1) = \sigma_1^2$ and $Var(\epsilon_2) = \sigma_2^2$. The random variables $x$, $\epsilon_1$ and $\epsilon_2$ are independent. Using anything you wish from the formula sheet, calculate $Cov(y_1, y_2)$. **Circle your final answer.**