1. (a) For i = 1,2,3 represent the process $f_i(X(t))$ as an Ito process, i.e. in the form

   Use (3.3): $df(X(t)) = f'(X(t))dX(t) + \frac{1}{2}f''(X(t))d[X,X](t)$

   $df(X(t)) = \sum_{i=1}^{d} \partial_i f(X(t))dX(t) + \frac{1}{2}\sum_{i,j=1}^{d} \partial_{ij} f(X(t))d[X_i, X_j](t)$

   Or (3.8): $df(X(t)) = [f'(X(t))\mu + \frac{1}{2}f''(X(t))\sigma^2]dt + f'(X(t))\sigma dW(t)$

   Function depends on both t and X

   i. $f_1(x) = x^3$

      $d(f_1(x)) = (3x_t^2\mu(t) + \frac{3\cdot 2}{2}\sigma^2(t))dt + 3x_t^2\sigma(t)dW(t) = (3x_t^2\mu(t) + 3\sigma^2(t))dt + 3x_t^2\sigma(t)dW(t)$

   ii. $f_2(x) = exp(x)$

      $d(f_2(x)) = (exp(x_t)\mu(t) + \frac{1}{2}exp(x_t)\sigma^2(t))dt + exp(x_t)\sigma(t)dW(t)$

   iii. $f_3(x) = 6x + 2$

      $d(f_3(x)) = (6\mu(t) + 0)dt + 6\sigma(t)dW(t) = 6\mu(t)dt + 6\sigma(t)dW(t)$

   (b) By $d[X,X](t) = \sigma^2(t)dt$ we just consider diffusion coefficient of previously computed processes

   i. $d[f_1(x), f_1(x)](t) = 9x_t^4\sigma^4(t)dt$

   ii. $d[f_2(x), f_2(x)](t) = e^{2x}\sigma^2(t)dt$

   iii. $d[f_3(x), f_2(x)](t) = 36\sigma^2(t)dt$

   (c) By (3.2) $dX(t)dY(t) = d[X,Y](t)$, and since the quadratic variation of standard Brownian motion W is $[W,W](t) = t$ it yields to $d[X,Y](t) = \sigma_x(t)\sigma_y(t)dt$

   $d[f_1(x), f_3(x)](t) = 3x_t^2\sigma(t)6\sigma(t)dt = 18x_t^2\sigma^2(t)dt$