1. The general form of the Taylor series of a function $f(x)$ around the point $a$ is

$$f(x) = \sum_{i=0}^{\infty} \frac{1}{i!} \frac{d^i f(x)}{dx^i} \bigg|_{x=a} (x-a)^i$$

(1)

where the value of the $i$th derivative is evaluated at the point $x = a$.

(a) (10 points) What is the Taylor series of $f(x) = \sin(x)$ up to $i = 3$ (third order) using the above expression around the point $x = 0$?

$$f(x) \approx $$

(b) (10 points) What is the Taylor series of $g(x) = ax^3 - bx$ around $x = 0$ up to third order ($i = 3$)?

$$g(x) \approx $$

(c) (5 points) How does the Taylor series of $g(x)$ change if we take the Taylor series to fourth order ($i = 4$)? Answer in no more than one sentence.
2. For fun if you finish early: Up to second order, what is the Taylor series of the function

\[ h(x, y) = \sin(x) \cos(y) \]  

around the point \((x, y) = (\pi, 0)\)?