1. (4 pts) Suppose we were to use the limit definition to compute the derivative of cosine. The first step would be to write

$$\cos'(x) = \lim_{h \to 0} \frac{\cos(x+h) - \cos(x)}{h}$$

What would be the next step?

use trig identity to replace $\cos(x+h)$

$$\cos'(x) = \lim_{h \to 0} \frac{\cos(x)\cos(h) - \sin(x)\sin(h) - \cos(x)}{h}$$ ✓

since $\cos(a+b) = \cos(a)\cos(b) - \sin(a)\sin(b)$

2. (2 pts) Compute the derivative of

$$f(t) = 3\cos(t) - 4\sin(t)$$

$f'(t) = -3\sin(t) - 4\cos(t)$ ✓

3. (4 pts) Determine the local linearization to $f(t) = 3\cos(t) - 4\sin(t)$ at $t = \frac{\pi}{2}$, and use it to estimate the value $f(1.5)$. How well does the estimate do?

$\left(\frac{\pi}{2}, -4\right)$

$x \quad y$

$f'(t) = -\sin(t)3 - 4\cos(t)$

$\boxed{y - (-4) = -3\left(x - \frac{\pi}{2}\right)}$ $\quad L(x) = -4 - 3\left(x - \frac{\pi}{2}\right)$

$f(1.5) = 3\cos(1.5) - 4\sin(1.5) = -3.771769341$

$y = -3x + 0.712388$

$\downarrow$

good

$y = -3(1.5) + 0.712388 = -3.787612$

The estimate did well.

Well done.