6. Let $f(x) = \sin x$ where x is in ***degrees***.

(a) (4 points) Write down a formula for $f'(180)$ using the *limit* definition of the derivative.

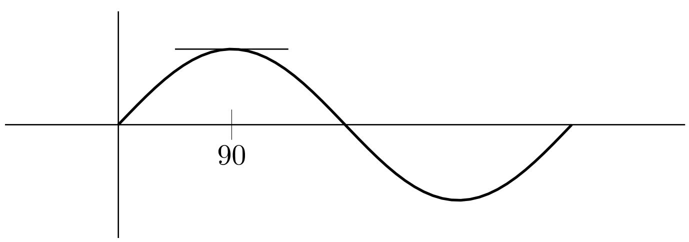
$$f'(180) = \lim_{h\to 0} \frac{\sin(180+h) - \sin(180)}{h} = \lim_{h\to 0} \frac{\sin(180+h)}{h}$$

(b) (3 points) Use the *limit* definition to approximate $f'(180)$ to 3 decimals. Show how you obtained your answer.

Plugging $h = 0.1$ into $\frac{\sin(180+h)}{h}$, we find it is approximately -0.01745.
Plugging $h = 0.01$ yields the same approximation (-0.01745).
Also, letting $h = -0.01$, we have ≈ -0.01745.
Thus, we can say

$$f'(180) \approx -0.0175$$

(c) (2 points) What is the exact value of $f'(90)$? Justify your answer geometrically.



The tangent line at $x = 90$ is horizontal, so $f'(90) = 0$.

(d) (2 points) Let $g(x) = \sin x$ where x is in radians. Determine a continuous function $h(x)$ such that for all x, $f(x) = g\big(h(x)\big)$.

$$h(x) = \frac{\pi}{180}x$$

[Note: This answer is not unique.]