# Worksheet 10

**Exercise 1**    *Find the limit. Hint: you can use l'Hôpital's rule*

**a.**    $\displaystyle\lim_{x\to 0^+} \frac{1}{\sin x} - \frac{1}{\tan x}$

**b.**    $\displaystyle\lim_{x\to 0^+} x\tan(1/x)$

**c.**    $\displaystyle\lim_{x\to 0^+} \sin x \ln x$

**Exercise 2**    *Prove that for all $x \in [0, \frac{\pi}{2}]$*

$$\arcsin(x) + \arccos(x) = \frac{\pi}{2}$$

**Exercise 3**    *In a murder investigation, the temperature of the corpse was $32.5°$C at 1:30 PM and $30.3°$C one hour later. Normal body temperature is $37.0°$C and the temperature of the surroundings was $20.0°$C. When did the murder take place?*

*Hint: we recall the law of cooling ($T_s$ is the temperature of the surroundings)*

$$\frac{dT}{dt} = -a(T - T_s)$$

*which gives*

$$T(t) = T_s + \big(T(0) - T_s\big)e^{-at}$$

**Exercise 4**    *Find the domain and sketch the graph of*

**a.**    $f(x) = \sin(\arcsin x)$

**b.**    $g(x) = \arcsin(\sin x)$