Sample Problem Sheet

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1. $y = \arcsin(x)$
2. A coin is weighted so that heads is four times as likely as tails. Find the probability that: (a) tails appears, (b) heads appears
3. Given
$$\begin{aligned}\lim_{x\to 0}\frac{\cos x - 1}{x} &= 0\\ \lim_{x\to 0}\frac{\sin x}{x} &= 1\end{aligned}$$
differentiate from first principles $f(x) = \cos x$.
4. $y = \cos(x^2)\sin x$.
5. Find $\frac{dy}{dx}$, given
$$y^2 = \frac{x^3}{2-x}$$
6. $y = \tan x$
7. Find the gradient of the unit circle ($x^2 + y^2 = 1$).
8. $y = \arctan x = \tan^{-1} x$
9. $y = (x+1)\ln(x+1)$.
10. Under which of the following functions does $S = \{a_1, a_2\}$ become a probability space?
(a) $P(a_1) = \frac{1}{3}$, $P(a_2) = \frac{1}{2}$ (b) $P(a_1) = \frac{3}{4}$, $P(a_2) = \frac{1}{4}$
(c) $P(a_1) = 1$, $P(a_2) = 0$ (d) $P(a_1) = \frac{5}{4}$, $P(a_2) = -\frac{1}{4}$