

Sample Problem Sheet

Nicola Talbot

March 13, 2013

1. Differentiate from first principles $f(x) = \sqrt{x}$
2. Differentiate the following functions:
 - (a) $y = \cos(x^2) \sin x$.
 - (b) $y = \arccos x$.
 - (c) $y = \exp(3x + 2)$
 - (d) $y = x^3 + 4x^2 - x + 3$
 - (e) $f(x) = g(x)^{h(x)}$.
3. Find the gradient of the ellipse given by $4x^2 + 3y^2 = 25$.
4. Find the gradient of the unit circle ($x^2 + y^2 = 1$).
5. 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) $P(a_1) = \frac{5}{4}, P(a_2) = -\frac{1}{4}$
6. A coin is weighted so that heads is four times as likely as tails. Find the probability that: (a) tails appears, (b) heads appears
7. Which of the following is the derivative of $x \sin(x)$? (Circle the correct answer.)
 - A** $\sin(x)$
 - B** $x \cos(x)$
 - C** $\sin(x) + x \cos(x)$
8. Describe what is meant by object-oriented programming.