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) $P(a_1) = \frac{3}{5}$, $P(a_2) = \frac{1}{2}$
   (c) $P(a_1) = 1$, $P(a_2) = 0$  
   (d) $P(a_1) = \frac{3}{4}$, $P(a_2) = -\frac{1}{4}$

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.