- 1. Determine the derivatives of the following functions
- a)  $[3K] k(x) = (3x^5 + 2x)(3\cos x)$

b) [3K]  $m(x) = -e^{2x} \cos 3x$ 

- c) [3K]  $h(x) = \sqrt{7 + \sqrt{x^5}}$
- d) [4K]  $f(x) = \frac{(2x-1)^2}{\sqrt{x-1}}$

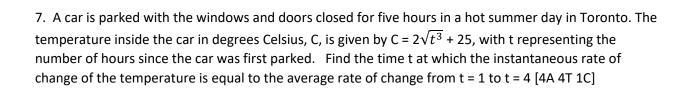
2. The height of the tides at a certain spot in Nova Scotia can be found by the equation h(t) =5sin(0.5t + 2) + 6, where t is the time in hours (using a 24 hour clock) and h is the height in metres. What is the rate of change of height at a time of 07:00 h? [4A 2C]

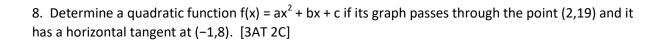
3. Determine the equation of the tangent to the curve  $y=e^{-x}$  at the point where x=-1. [3A 1C]

4. RockHard Productions holds weekly events in an arena with a seating capacity of 15 000 spectators. With ticket prices at \$12, the average attendance is 11 000 fans. A market survey indicates that for every dollar that ticket prices are lowered, the average attendance will increase by 100 fans. How should the production company set ticket prices to maximize their revenue? [5A 3C]

5. Carbon-14 is a radioactive substance produced in the Earth's atmosphere and then absorbed by plants and animals on the surface of the earth. It has a half-life of approximately 5730 years. Using this known piece of information, scientists can date objects such as the Dead Sea Scrolls. The function  $N = N_0 e^{-\lambda t}$  represents the exponential decay of a radioactive substance. N is the amount remaining after time t in years,  $N_0$  is the initial amount of the substance and  $\lambda$  is the decay constant. Find the rate of change of an initial amount of 1 gm of carbon-14 found in the scrolls, if the decay constant is given as  $\lambda = 1.21 \times 10^{-4}$ . [3A 1C]

6. Given the curve  $y = x\sqrt{x}$  at what point on the curve is the tangent parallel to the line 3x - y + 6 = 0? [3A 1T 1C]





9. Suggest a function that would have a derivative of  $f'(x) = 12x^2 + 4x - 10$ . Explain how you arrived at your answer. [2T 2C]