MCV 4U – Grade 12 Calculus & Vectors, University Preparation

1. [8] Find the derivative.

a) $y = 8\cos^3(2x)$

b) $y = 4^{7x}$

c) $y = 3x^2 \sin x$

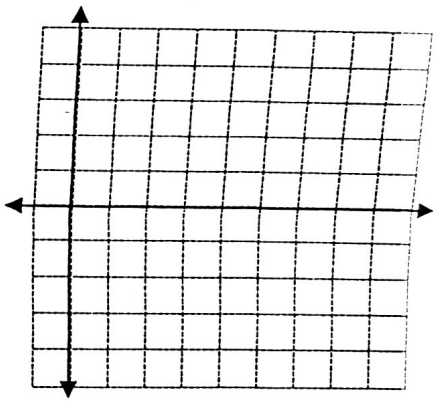
d) $y = \dfrac{\sin x}{e^x}$

2. [3] Find the equation of the tangent at $y = 4\sin(3x)$ at $x = \dfrac{\pi}{6}$.

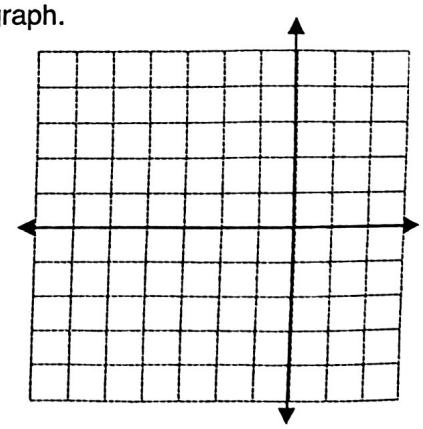
3. [4] Find the derivative of y = cot x.

4. [3] The length of Kathleen's spring in centimetres after t seconds is given by $L(t) = A\cos(2\pi ft)$. Determine the minimum and maximum length and when they occur if the spring has an amplitude of 10 cm and a frequency of 3 hertz (three oscillations per second).

5. [9] Graph $y = \sin x - \frac{\sqrt{3}}{2}x, 0 \le x \le 2\pi$ and state the domain, range, interval of increase and interval of decrease



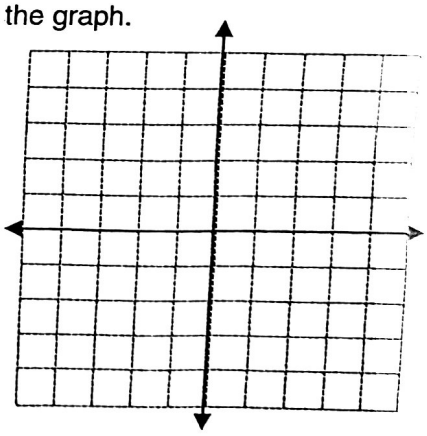
6. [6] Find the absolute maximum and minimum of $y = x(2^x), -4 \le x \le 1$ and draw the graph.



7. [5] The world's population doubles every 35 years. If there are presently 7 billion people determine
a) the population in 100 years.
b) When the population will be 50 billion.
c) how fast the population is growing in the 100^{th} year.

8. [2] Is it possible to find the derivative of $y=\left(-\frac{1}{2}\right)^x$? Explain.

9. [6] Find the absolute maximum and minimum of $y = e^x \sin x, -\pi \leq x \leq \pi$ and draw the graph.



10. [4] Find the 100th derivative of $y = \sin 2x$

11. [6] Find the equation of the tangent to $y = x^2 e^x$ at x = 2