Supplementary Notes for Year 11 (Term 4)

<u>Week 32: Unit 2 Revision Questions</u>

Technology Free (40 marks):
1. For $y = x^3 + 3x^2 + 2x + 1$:
   a) Find the co-ordinate of the point when x = 2 (1)
   b) Hence find the equation of the tangent to the curve at the point where x = 2 (3)

2. Using calculus, find the co-ordinates for the stationary point(s) and determine their natures:
   a) $y = 9 + 12x - 2x^2$ (4)
   b) $y = x^3 - 6x^2 + 12x - 7$ (4)

3. Find the antiderivative of:
   a) $f'(x) = 3x^2 + 7x + 5$ (1)
   b) $y = x^4 + \frac{1}{x^2}$ (1)
   c) For part (a), we know f(-1.5) = 0. Find what f(x) is. (3)

4. Solve the following equations for x:
   a) $2^x + \frac{1}{2^x} - 2 = 0$ (2)
   b) $x = \log_{216}(4) + 2\log_{216}(3) - \log_{216}(6)$ (2)

5. For the rule $y = \left(\frac{1}{2}\right)^{x-3} + 1$:
   a) State the implied domain of the function (1)
   b) State the range of the function (1)
   c) Sketch the graph below, including all key points and asymptotes (3)
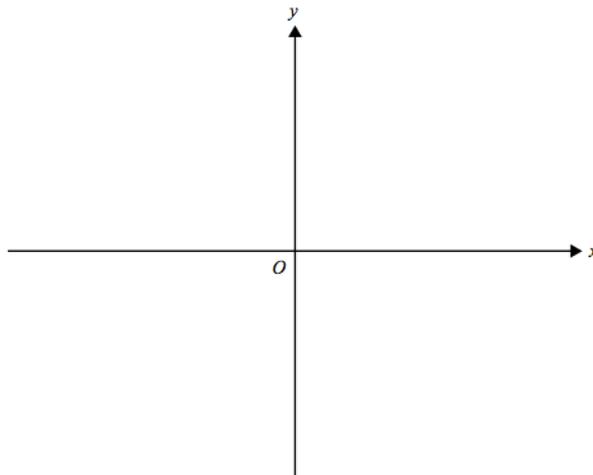
6. For the circular function $y = 2\cos(2x) + 1$:
   a) State the period, amplitude, minimum and maximum values of the function (4)
   b) Draw the graph of the function over $x \in [0, 2\pi]$. Only show the endpoints. Intercepts are not necessary. (2)
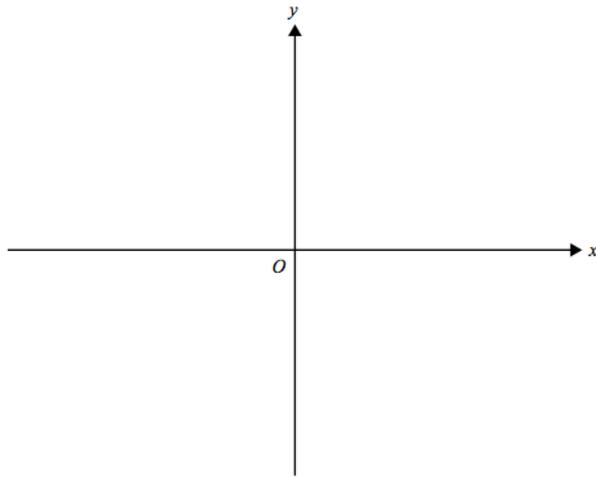
7. Find the solution(s) to the equation $\sin(x) = -\frac{\sqrt{3}}{2}$ over $x \in [0,4\pi]$ (2)

8. For the following, you may use factorial notation in lieu of an exact answer:
    a) There are ten books to be sorted in a bookshelf. There are three non-identical Chemistry books and seven non-identical Math books. How many possible arrangements are possible if there had to be a chemistry book at either end of the bookshelf? (2)
    b) If I were to randomly put the books on the bookshelf, what is the probability that I get the arrangement above? (2)
    c) Presume that I wanted to arrange the books in a circle so that I can topple them down later (book dominos), and I put all the Chemistry books next to each other sequentially in the circle. How many possible circle arrangements are there? (2)

Technology Free (tougher, 15 marks):

9. A scientist creates a machine to measure vibrations in the room, with a scale similar to the Richter Scale. Let x be the amount of movement in a room, measured in an arbitrary unit, and let y be the machine's response. The machine's response is described by $y = m\log_e(x + 10) + n$. It was found that if there were no vibrations in the room, then the machine had a response of 15. Similarly, if there was a vibration of scale 30 in the room, the machine had a response of 30 too. Find m and n, but express n in the form $a\left(1 - \frac{b}{c}\right)$. (6)

10. Let $\sin\left(\frac{\pi}{8}\right) = 0.383$, $\cos\left(\frac{\pi}{8}\right) = 0.924$ and $\tan\left(\frac{\pi}{8}\right) = 0.414$. Find $\sin\left(-\frac{\pi}{8}\right)$, $\cos\left(\frac{7\pi}{8}\right)$ and $\tan\left(\frac{9\pi}{8}\right)$, ensuring you show working out. (3)

11. Find the solution(s) to the equation $\sin 2\left(x + \frac{\pi}{3}\right) = \frac{1}{2}$ over $x \in [0,2\pi]$ (3)

12. If $\log_b(5) = r$, $\log_b(3) = q$ and $\log_b(2) = p$, find $\log_b\left(\frac{5\sqrt{3}}{2}\right)$ in terms of r, p and q. (3).