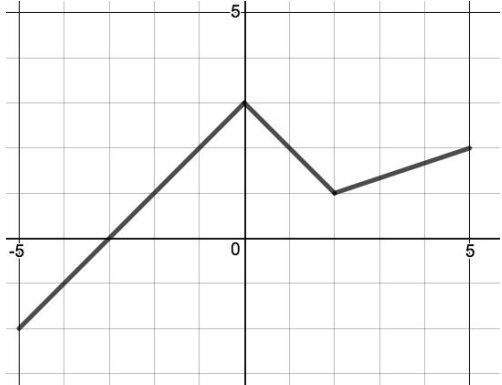# Math SL PROBLEM SET 91

1. **(SP5.9 - R) (CA)** A normally distributed variable, X, has a mean of 259 and it is known that $P(X < 261.51) = 0.9184$. Find the standard deviation of X.　　　**(Cirrito 17.2, p568)**

2. **(T3.5 - R) (CI)** Solve $\cos^2(x) = 2\cos(x)$ on the domain of $-\pi \le x \le \pi$.　　**(Cirrito 10.4, p351)**

3. **(F2.3; C6.1, 6.5 - R) (CI)** Given the graph of the function f:　　**(Cirrito 6.1, 6.2; p167,177)**

   a. $h(x)$ is defined as $h(x) = 2f(x) + 1$. Sketch $h(x)$.
   b. $k(x)$ is defined as $k(x) = f[2(x - 1)]$. Sketch $k(x)$
   c. $m(x)$ is defined as $m(x) = f(-\frac{1}{2}x) + 3$. Sketch $m(x)$.
   d. Determine the value of $f\,'(1)$ and $\frac{d}{dx}f(3)$.

   e. Evaluate $\displaystyle\int_{-5}^{5} f(x)dx$.

4. **(CA6.5 - N) (CA)** Find the exact volumes of revolution that are obtained when the following graphs are rotated about the x-axis:　　**(Oxford 9.6, p318)**

   a. $f(x) = \sqrt{2x}$ between $x = 0$ and $x = 4$.
   b. $g(x) = \frac{3}{x}$ between $x = 1$ and $x = 3$.

5. **(A1.3 - R) (CA)** In the expansion of $(3x + 1)^n$, the coefficient of the term in x^2 is $135n$, where $n \in Z^+$. Find the value of n.　　**(Cirrito 4.1, p95)**

6. **(SP5.9 - R) (CA)** A manufacturer does not know the mean and standard deviation of the diameters of ball bearings she is producing. However a sieving system rejects all ball bearings larger than 2.4 cm and those under 1.8 cm in diameter. It is found that 8% of the ball bearings are rejected as being too small and 5.5% are rejected as being too big. What is the mean and standard deviation of the ball bearings produced?　　**(Cirrito 17.2, p568)**

Math SL PROBLEM SET 91

7. **(CA6.6 - R) (CI/CA)** An object starts by moving from a fixed point, O. Its velocity v ms^{-1} after t seconds is given by $v(t) = \sqrt{3}\sin(t) + 4\cos(t)$, $t \geq 0$. **(Cirrito 22.6, p764)**

    a. (CI) Find the velocity at $t = \frac{\pi}{3}$ seconds.

    b. (CI) Find the displacement between t = 0 and $t = \pi$ seconds.

Let d be the displacement from the fixed point of O when $t = 4$.

    c. (CA) Write down an integral which represents d and hence calculate the value of d.

    d. (CA) Write down an integral which represents the total distance travelled and hence, determine the total distance travelled in those 4 seconds.

8. **(CA6.5 - E) (CI)** For the function $g(x) = \frac{ln(x)}{x^2}$ where $x > 0$, determine (if they exist): **(Cirrito 20.2, p649)**

    a. the x-intercept(s)

    b. How do you know that the function has a horizontal asymptote at $y = 0$?

    c. the coordinate(s) of the stationary point(s)

    d. the x-coordinate(s) of the inflection point(s)

    e. Sketch the graph of $g(x)$.