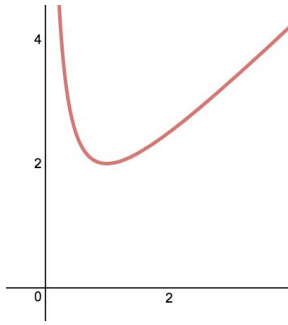
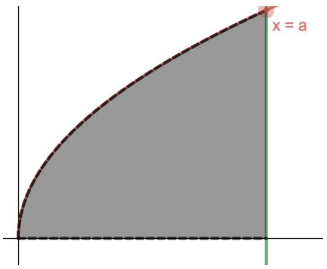
Math SL PROBLEM SET 77

Section A (Short Answer)

1. **(CA6.5 - R) (CI)** Find the area of the region enclosed by the curve $f(x) = x + 1/x$, the x-axis and the lines $x = 1$ and $x = e$.





2. **(CA6.5 - R) (CI)** The area of the region enclosed by the curve $y^2 = 4ax$ and the line $x = a$ is ka^2 units. Find the value of k.

3. **(CA6.5 - R) (CI)** Find the volume of the solid of revolution formed when rotating the area under the curve $y = e^x$ bounded between $x = 1$ and $x = 5$ about the x-axis.

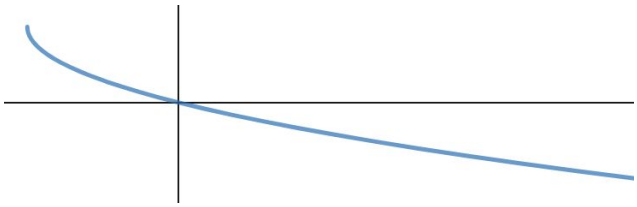
4. **(CA6.5 - R) (CA)** The volume of the solid of revolution formed when rotating the area under the curve $y = x + 1$ bounded between $x = 0$ and $x = K$ about the x-axis is 21π. Find K.

5. **(CA6.5 - R) (CI)** Evaluate the following integrals:

a. $\int_0^2 e^{2x+1}\,dx$ b. $\int_{-1}^0 \frac{3}{1-2x}\,dx$ c. $\int_0^{\pi} \left(\cos(x) - \sin\left(\frac{x}{2}\right)\right) dx$

6. **(CA6.5 - R) (CI)** Find $f(x)$ given that:

a. $f`(x) = 2x + 1$ and $f(1) = 5$.
b. $f`(x) = 2 - x^2$ and $f(2) = 7/3$.
c. $f`(x) = \sin(2x) + 2x$ and $f\left(\frac{3\pi}{4}\right) = \frac{9\pi^2}{16}$.



7. **(CA6.6 - R) (CI)** A body moves along a straight line in such a way that its velocity is given by $v(t) = 2 - \sqrt{t+4}$ (see diagram above). After 5 seconds of motion, the body is at the origin.
   a. Find the displacement equation.
   b. Find the displacement after in the first 12 seconds of travel

8. **(CA6.3 - R) (CI)** Find the coordinates and nature of the stationary points for $f(x) = x^3 - 6x^2 + 8$ and hence the intervals of increase and decrease.

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9. **(CA6.3 - R) (CI)** Find the coordinates and nature of the stationary points for $f(x) = e^x\cos(x)$ on the domain of $0 \leq x \leq 2\pi$ and hence the intervals of increase and decrease.

10. **(CA6.3 - R) (CI)** Find the coordinates and nature of the stationary points for $f(x) = \frac{(1+x)^2}{e^x}$ and hence the intervals of increase and decrease.

11. **(T3.5 - R) (CI)** Solve $\cos^2(x) = 2\cos(x)$ on the domain of $-\pi \leq x \leq \pi$.

12. **(T3.5 - R) (CI)** Solve $2\sin^2(x) + 5\cos(x) + 1 = 0$ on the domain of $0 \leq x \leq 2\pi$.

13. **(T3.5 - R) (CI)** Solve $\cos(2x) = \sin(x)$ on the domain of $-\pi \leq x \leq \pi$.

Section B (Extended Response/Investigation)

14. **(SP5.8 - R) (CA)** At an election, 40% of the voters favoured the Environmental Party. Eight voters were interviewed at random. Find the probability that:

    a. Exactly 4 voters favoured the Environmental Party
    b. A majority of those interviewed did not favour the Environmental Party

15. **(SP5.8 - R) (CA)** Terry wins 2 out of 3 chess matches in which he plays. If Terry plays 5 games, find the probability that he:

    a. Wins exactly 4 games.
    b. No more than 2 games.
    c. At most 4 games.
    d. All 5 games.

16. **(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.