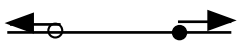
QUESTION 1

a $0{\cdot}477$ **b** $\dfrac{30+3\sqrt{5}}{19}$ **c** $V=5\pi r^2=40$ c.c.
$r\approx 1{\cdot}596$

d  $x<1$ or $x\geq 3$ **e** $(3y-2)(y-2)$

QUESTION 2

a On the number plane, plot the points $A(-4,0)$, $B(4,6)$, $C(4,3)$ and the origin O.

b $AB=\sqrt{6^2+8^2}=10$ $\quad OC=\sqrt{3^2+4^2}=5$

c Grad $AB=\dfrac{6}{10}=\dfrac{3}{4}$ Equat AB $\quad 4y=3x+b$
$(4,6)\ 24=12+b$
$\therefore 3x-4y+12=0$

d Grad of $OC=\dfrac{3}{4}=$ Grad AB $\quad \therefore$ OC//AB

e $d=\dfrac{|12-12+12|}{\sqrt{3^2+4^2}}=\dfrac{12}{5}$

f Area OABC $=\dfrac{12}{5}\left(\dfrac{10+5}{2}\right)=18u^2$

QUESTION 3

a **i** $y=3x^5-\dfrac{2}{3\sqrt{x}}$
$\dfrac{dy}{dx}=15x^4+\dfrac{1}{3x\sqrt{x}}$

ii $y=4\cos(3x+2)$
$\dfrac{dy}{dx}=-12\sin(3x+2)$

iii $y=3x^2.\ln 4x$
$\dfrac{dy}{dx}=3x+6x\ln 4x$

b **i** $\displaystyle\int\left(x-e^{-2x}\right)dx$
$=\dfrac{1}{2}x^2+\dfrac{1}{2}e^{-2x}+c$

ii $\displaystyle\int_0^1 \sin\left(\frac{x}{2}\right).dx=\left[-2\cos\frac{1}{2}x\right]_0^1$
$\approx 2(1-{\cdot}878)\approx 0{\cdot}244$

c $\dfrac{dy}{dx}=\dfrac{1}{2\sqrt{x}}=\dfrac{1}{4}$; Equat of normal $y=-4x+18$

QUESTION 4

a **i** 12

ii Value 1st payment $= \$2000(1{\cdot}06)^{12} = \$4024{\cdot}39$

iii Return $= \dfrac{\$2000(1{\cdot}06)\left[(1{\cdot}06)^{12}-1\right]}{1{\cdot}06-1} = \$35764{\cdot}28$

b **i** $a+10d=50 \quad \therefore a=-10 \;\; d=6$
$a+2d=2$

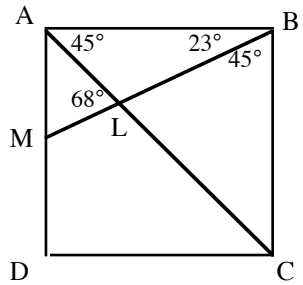
ii $S_{15}=\dfrac{15}{2}[-20+14\times 6]=480$

c **i** Pr (both diamonds) $=\dfrac{1}{4}\times\dfrac{12}{51}=\dfrac{1}{17}$

ii Pr (same suit) $=4\times\dfrac{1}{17}=\dfrac{4}{17}$

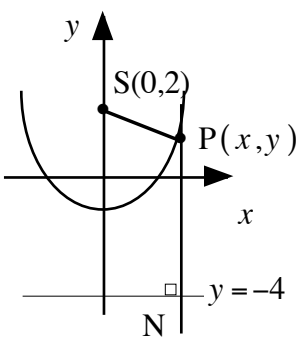
QUESTION 5

a



$\angle LBC=22°;\ \angle DAB=45°\ \left(\dfrac{1}{2}\text{ of }90°\right)$
$\angle DAB+\angle ABM=\angle ALM$ (ext $\angle$ of Δ)
$\therefore\ \angle ABM=23°$
$\angle CBD=45°$
$\therefore\ \angle LBC=22°$ (Sum to 90°)

b



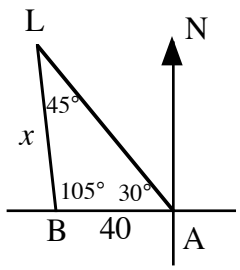
i $SP^2=PN^2$
$\therefore\ x^2+(y-2)^2=(y+4)^2$
$x^2=12(y+1)$

ii Vertex $(0,-1)$

iii Focal length $=3$

iv Latus Rectum $4a=12$

c **i**



ii $\dfrac{x}{\sin 30°} = \dfrac{40}{\sin 45°}$

$\therefore\ x \approx 28\,nm$

QUESTION 6

a **i** $I = \dfrac{1}{3}\left(e^{3} - 1\right)$

$= 6 \cdot 36$

ii $I = \left[\dfrac{1}{3}t^{3} + t^{-3}\right]_{1}^{2}$

$= 1 \cdot 46$

b $I = \dfrac{1}{2}(2-1) \times [2 + 3 + 2(7 + 9 + 6)]$

$= 24 \cdot 5$

c $\dfrac{d}{dx} x \ln x = 1 + \ln x$ so $\displaystyle\int_{1}^{e} \ln x \,.\, dx = [x \ln x - x]_{1}^{e}$

$= 1$

QUESTION 7

a **i** we have $W(0) = W_0 e^{k.0} = 2 \Rightarrow W_0 = 2$

and $W(8) = 2e^{k.8} = 13$

so $k = \dfrac{1}{8}\ln 6 \cdot 5$

$k = 0 \cdot 23$ to 2dp

ii $2e^{kt} = 200$ then $t = \dfrac{\ln 100}{\frac{1}{8}\ln 6 \cdot 5}$

ie during the 20th day, $t \approx 19 \cdot 68$

b **i** $P(DD) = \dfrac{5}{15} \times \dfrac{4}{14}$

$= \dfrac{2}{21}$

ii $P(GG) = \dfrac{10}{15} \times \dfrac{9}{4}$

$= \dfrac{3}{7}$

c $P(\text{at least 1 defective}) = 1 - \dfrac{5}{15} \times \dfrac{4}{14} \times \dfrac{3}{13} \times \dfrac{2}{12} = \dfrac{272}{273}$