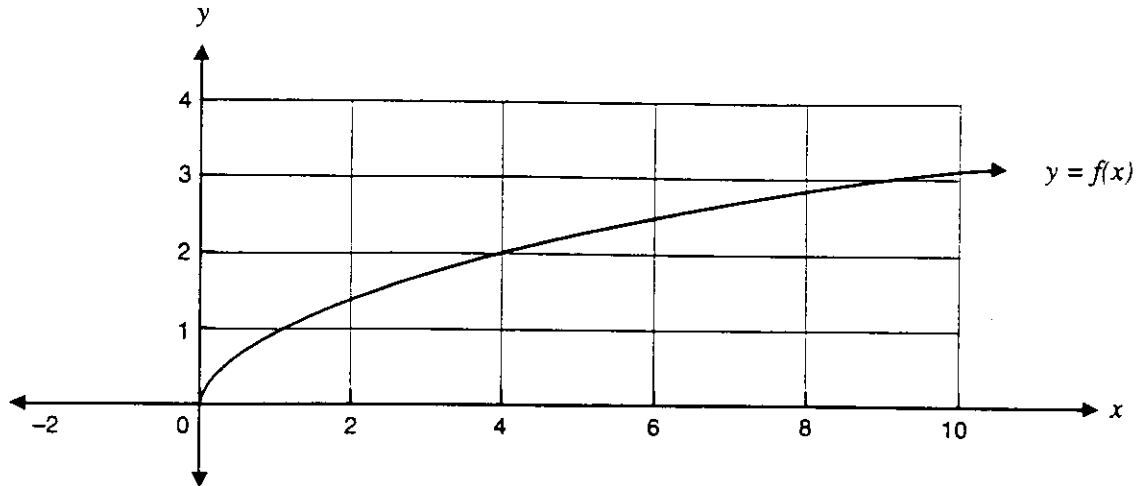---

Specific instructions to students

Answer **all** questions in this part in the spaces provided.

Question 1

The graph of the function $f:[0,\infty) \to R, f(x) = \sqrt{x}$ is shown below.

i.   Find the equation of the tangent to the graph of $f(x)$ at $x = 1$.

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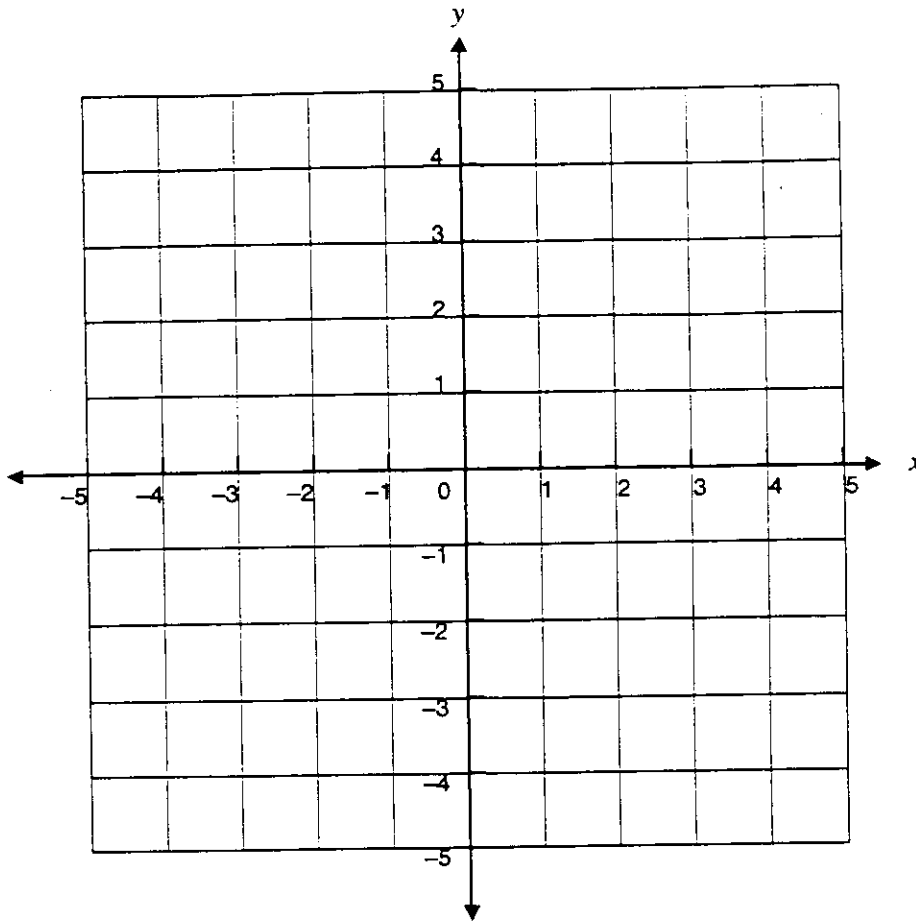_____

_____

ii. Sketch the tangent on the axes above and clearly **label** its points of intersection with the axes.

2 + 1 = 3 marks

TURN OVER

Question 2

i.   On the set of axes below, sketch the graph with equation

$$y = 2e^x - 4$$

ii.   Find the **rule** for the inverse of the function

$$f: R \rightarrow R, f(x) = 2e^x - 4$$

_____

_____

_____

_____

iii.   On the same set of axes, sketch and clearly **label** the graph of the inverse of f.

$$1 + 1 + 1 = 3 \text{ marks}$$

Question 3

The graph of $y = \cos x$ is transformed into the graph of $y = 2 \cos x$ by a **dilation in the y-direction by a scale factor of 2.**

In each case below state the type of transformation together with any relevant scale factors, distances and directions required to transform the graph of the first equation into the graph of the second equation.

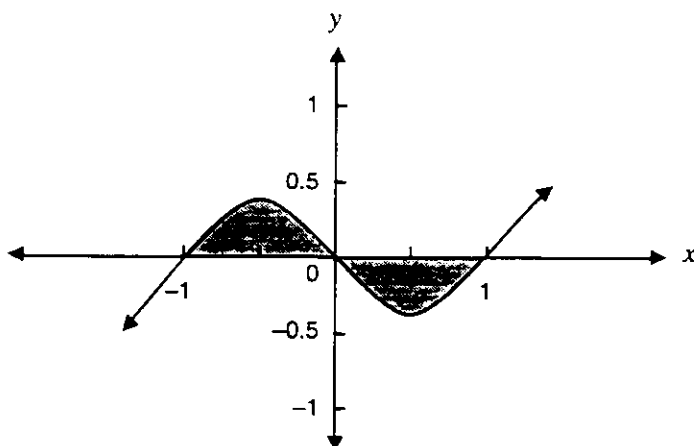   i. $y = 2 \cos x$ to $y = 2 \cos(0.5x)$

_____

_____

    ii. $y = 2 \cos(0.5x)$ to $y = 2 \cos\left(0.5\left(x - \dfrac{\pi}{4}\right)\right)$

_____

_____

    iii. $y = 2 \cos\left(0.5\left(x - \dfrac{\pi}{4}\right)\right)$ to $y = 2 \cos\left(0.5\left(x - \dfrac{\pi}{4}\right)\right) + 2$

_____

_____

$1 + 1 + 1 = 3$ marks

Question 4

The graph with equation $y = x (x + 1)(x - 1)$ is shown below.

Find the exact value of the shaded region.

_____

_____

_____

_____

2 marks

TURN OVER

Question 5

Stanley rides a bicycle to work each day. It may be assumed that the journey time is a normally distributed random variable with a mean of 25 minutes.

Calculate the standard deviation of Stanley's journey time, if the journey time exceeds 20 minutes on 90 per cent of occasions.

2 marks

Question 6

In this question p represents the population proportion and $\hat{p}$ represents a sample proportion.

A random sample of 100 people is selected from the population of a country. Of this sample 30 people believed that their president was doing an excellent job.

a. Find an approximate 95 per cent confidence interval estimate for the proportion of the population, p, who believed that their president was doing an excellent job.

b. What is the minimum sample size so that the standard error of the sample proportion, $\hat{p}$, is less than 0.01?

2 + 2 = 4 marks

Total 17 marks