

Extension 1 Functions Worksheet



1. Consider the function $f(x) = (x^4 + 3x^2)/(x^4 + 3)$
Show that
 - (i) $f(x)$ is an even function.
 - (ii) What is the equation of the horizontal asymptote to the graph $y = f(x)$?
 - (iii) Find the x-coordinates of all stationary points for the graph $y = f(x)$.
 - (iv) Sketch the graph $y = f(x)$. You are not required to find any points of inflexion.
2. Let $f(x) = (3 + e^{2x})/4$
 - (i) Find the range of $f(x)$
 - (ii) Find the inverse function $f^{-1}(x)$
3. Let $f(x) = \ln(x-3)$. What is the domain of $f(x)$?
4. On the same set of axes, sketch the graphs of $y = \cos 2x$ and $y = (x+1)/2$, for $-\pi \leq x \leq \pi$.
Use your graph to determine how many solutions there are to the equation $2 \cos 2x = x + 1$ for $-\pi \leq x \leq \pi$.
5. Let $f(x) = \log_e\{(x-3)(5-x)\}$. What is the domain of $f(x)$?
6. The function $f(x) = \tan x - \log_e x$ has a zero near $x = 4$.
7. Sketch the graph of $y = |2x - 1|$
Hence, or otherwise, solve $|2x - 1| \leq |x - 3|$
8. If $f(x) = (x + 1)/x$, find the value of
 - (i) $f(1)$
 - (ii) $f(-1)$
 - (iii) $f(1/2)$

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9. Taking the function $f(x) = (x - 3) \log x$, prove that there is at least one value of x in $(1, 3)$ which satisfies $x \log x = 3 - x$.
10. Let $f(x) = \log_e(1 + e^x)$ for all x . Show that $f(x)$ has an inverse.