Test 1 (show ALL working)

Answer ALL questions.

No Eton tables. No Calculators. Time Allowed: 50 minutes

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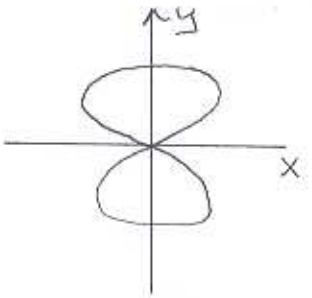
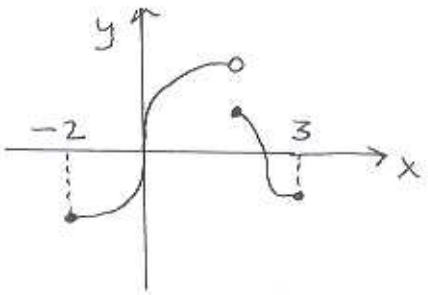
1. Define what it means for $y = f(x)$ to be a function.

2. If $f(x) = 8x^2 + 3$, calculate $f(x + h)$.

3. Explain why each of the pictures below is (or is not) a graph of a function:





For questions 4 to 7, differentiate the given $y(x)$, stating any "rules" you use:

4. $y = \dfrac{2}{x} + \cos(x)$

5. $y = x^3 \log(x)$

6. $y = \cot(x) = \dfrac{\cos(x)}{\sin(x)}$

7. $y = 2\log\left(\sqrt{1 + x}\right)$

For questions 8 and 9, determine the first AND second derivatives of the given $f(x)$:

8. $f(x) = e^x \sin(x)$

9. $f(x) = ax^2 + bx + \log(\beta x)$, $\quad a, b, \beta$ =constants.

10. (a) State the *chain rule* for $y = f(g(x))$.

(b) Differentiate $y = [x + \cos(x)]^{3/2}$