

Math191 Class Test 13 November 2009

- The exam is **45 minutes** long.
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- No books or notes are allowed.
- Attempt as many questions as you can. **FULL MARKS** will be given for complete answers to **ALL** seven questions. The marks available for each question are indicated in square brackets in the right margin.
- Please turn your **MOBILE PHONES OFF** and **DON'T TALK**.

1. State the domain and range of the following functions:

- a) $f(x) = \cos(2x)$;
b) $g(x) = |x + 2|$.

[6 marks]

2. Let

$$f(x) = \frac{2x + 3}{x - 1}.$$

Find the inverse function $f^{-1}(x)$. State the domain and range of f (NOT the inverse function) and sketch its graph, marking any horizontal or vertical asymptotes, and any zeros.

[10 marks]

3.

- a) Find the exact value of $\cos^{-1}(-1/2)$.
- b) Give the general solution of the equation $\cos x = -\frac{1}{2}$.

[6 marks]

4. In this question, give exact answers (in terms of $\pi, \sqrt{3}$ etc.) and not for approximations to any number of decimal places.

a) Convert $(2, -2\sqrt{3})$ from Cartesian to polar coordinates.

b) Convert $(1, 7\pi/6)$ from polar to Cartesian coordinates.

[6 marks]

5. Determine whether the following limits exist. Where they exist, evaluate them.

a) $\lim_{x \rightarrow \infty} \frac{x+1}{x-1}$

b) $\lim_{x \rightarrow -1} \frac{x^2-1}{x^3+1}$

[6 marks]

6.

Differentiate the following functions. In part a), also find the tangent line through the point $(1, 0)$.

a) $f(x) = x^3 - 1$.

b) $f(x) = x^2 \cos(2x - 1)$

c) $f(x) = \frac{2x}{x^2 + 1}$

[10 marks]

7.

a) Find the Maclaurin series of $f(x) = (1 - x)^{-1}$

b) Hence, or otherwise, find the Maclaurin series of $g(x) = (1 - 2x^2)^{-1}$.

[6 marks]