MATH191: Problem Sheet 2

Due *Monday 11th October*

1. Determine the inverse function $f^{-1}(x)$ of the rational function

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

2. State whether each of the following functions is increasing, decreasing, or neither (on their maximal domains):

$$\text{a) } f(x) = 2x + 1; \qquad \text{b) } f(x) = (x+1)^2; \qquad \text{c) } f(x) = x^3 - 4.$$

3. Determine whether each of the following functions is even, odd, or neither:

$$\text{a) } \sin(x^3); \qquad \text{b) } \frac{\cos(x)}{x}.$$

4. Evaluate the following. You should give exact answers in terms of π, $\sqrt{2}$, etc.: do not evaluate to any number of decimal places.

$$\text{a) } \sin(-\frac{\pi}{3}); \qquad \text{b) } \cos^{-1}(0); \qquad \text{c) } \tan^{-1}(\sqrt{3}).$$

5. Find the general solutions of the following equations:

$$\text{a) } \tan\theta = -1; \qquad \text{b) } \cos\theta = \frac{2}{5}; \qquad \text{c) } \sin\theta = \frac{1}{2}.$$

In part b), you should give your answer to four decimal places. In parts a) and c), you should give exact answers.

6. Use the formulae for $\sin(A+B)$, $\sin(2\theta)$ and $\cos(2\theta)$ to show that

$$\sin(3\theta) = 3\sin\theta - 4\sin^3\theta.$$

Check the result for $\theta = \pi/2$ and $\theta = \pi/6$.

I will collect solutions at the lecture on Monday 11th October. Any solutions which are not handed in then, or by 5pm that day in the envelope outside Office 516 in the Maths Building will not be marked. (My office, 515, is reached through 516.)