

MATH191: Practice Sheet 2

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

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

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

a) $f(x) = x^3 + 1$; b) $f(x) = x^2 + 1$; c) $f(x) = 1 - x$.

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

a) $\cos(x^3)$; b) $\frac{\sin(x^3)}{1+x^2}$.

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.

a) $\sin(-\frac{\pi}{4})$; b) $\cos^{-1}(1)$; c) $\tan^{-1}(1)$.

5. Find the general solutions of the following equations:

a) $\tan \theta = \frac{1}{\sqrt{3}}$; b) $\sin \theta = \frac{3}{5}$; c) $\cos \theta = -1$.

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 $\sin(2\theta)$ and $\cos(2\theta)$ to show that

$$\sin(4\theta) = 4 \sin \theta \cos \theta - 8 \sin^3 \theta \cos \theta.$$

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