Mathematics I **Worksheet 2** Name:

1. If $f(x) = 4x^3 + 7$, does f^{-1} exist? If so, find it. If not, explain why not.

2. Simplify $\tan\left(\cos^{-1}\left(\frac{3}{x}\right)\right)$.

3. Simplify $\csc\left(\sin^{-1}\left(\frac{3}{x}\right)\right)$.

4. Determine whether the function is one to one.
   (a) $f(x) = 2x + 4$.
   (b) $f(x) = |x|$.
   (c) $f(x) = x^2 - 2x$.

5. Find the inverse of function of f.
   (a) $f(x) = 3x + 5$.
   (b) $f(x) = \frac{2-x^3}{5}$.

6. Find the domain and range of $f(x) = \sqrt{9 - x^2}$.

7. Determine whether $f(x) = 2x^5 - 3x^2 + 2$ is odd, even or neither.

8. Find the functions $f \circ g$, $g \circ f$, $f \circ f$ and $g \circ g$ where $f(x) = 3x - 1$ and $g(x) = 2x - x^2$.

9. Simplify $\sin(\sin^{-1}\frac{1}{4})$.

10. Simplify $\cos^{-1}(\cos\frac{5\pi}{6})$.

11. Simplify $\tan(\sin^{-1}\frac{1}{2})$.

12. If x be real then the range of the function $f(x) = \frac{x}{1+x^2}$ is
    (a) $[-1/2, 1/2]$
    (b) $(-2, 2)$
    (c) $(-1, 1)$
    (d) $(-1/2, 1/2)$

13. If $f(x) = \frac{1}{1-x}$, $g(x) = f(f(x))$ and $h(x) = f(f(f(x))$, then $f(x) \cdot g(x) \cdot h(x)$ is equal to

(a) $\frac{1}{(1-x)^3}$

(b) $\frac{1}{1-x}$

(c) 1

(d) -1

14. Suppose that $g(x) = 1 + \sqrt{x}$ and $f(g(x)) = 3 + 2\sqrt{x} + x$. Then find the function $f(x)$.

15. $f(x) = \begin{cases} x+1, & x < 0 \\ x^2, & x \geq 0 \end{cases}$ and $g(x) = \begin{cases} x^3, & x < 1 \\ 2x-1, & x \geq 1 \end{cases}$. Then find $f(g(x))$ and find its domain and range.

16. Find the inverse of the function $f : [-1, 1] \to [-1, 1]$, $f(x) = x^2 \text{sgn}(x)$