

Quiz 1

August 31, 2016

Show all work and circle your final answer.

1. Given the 1-to-1 function $f(x) = -7 + 3x^3 + \tan \frac{\pi x}{2}$, $|x| < 1$, find the value of $f(f^{-1}(2\pi))$.

Recall: $f(f^{-1}(x)) = x$

$$\text{So } f(f^{-1}(2\pi)) = \boxed{2\pi}$$

2. The position of a particle at time t is given by $t^2 - 2t + 7$. Write (but do not evaluate) an expression to find the average velocity between time $t = 1$ and $t = 1.01$.

$$\text{Avg velocity} = \frac{\text{total distance}}{\text{total time}} = \boxed{\frac{(1.01)^2 - 2(1.01) + 7 - [1^2 - 2 + 7]}{1.01 - 1}}$$

3. Given the function

$$f(x) = \frac{4x - 3}{10 - 2x},$$

find:

- (a) The inverse function, $f^{-1}(x)$

$$y = \frac{4x - 3}{10 - 2x}$$

$$y(10 - 2x) = 4x - 3$$

$$10y - 2xy = 4x - 3$$

$$10y + 3 = 4x + 2xy$$

$$10y + 3 = x(4 + 2y)$$

$$x = \frac{10y + 3}{4 + 2y}$$

$$\text{So } \boxed{f^{-1}(x) = \frac{10x + 3}{4 + 2x}}$$

- (b) The domain of $f(x)$ and $f^{-1}(x)$.

$$\text{domain of } f(x): \boxed{x \neq 5}$$

$$\text{domain of } f^{-1}(x): \boxed{x \neq -2}$$