

In class work 21 has questions 1 through 1 with a total of 6 points. Turn in your work at the end of class *on paper*. This assignment is due at *Thursday 9 November 13:20*.

*“The place to improve the world is first in one’s own heart and head and hands, and then work outward from there.”*

ROBERT PIRSIG

1. For all real numbers  $x$ , we have  $\sin(x) = \sum_{k=0}^{\infty} \frac{(-1)^k}{(2k+1)!} x^{2k+1}$ .

- 2 (a) Find the power series representation for  $\sin(x) - x$  centered at zero. **Hint:** When you don’t know where to start, go to your happy place: write the first few terms of the Taylor series for sine centered at zero. Then subtract  $x$ .

- 2 (b) For  $x \neq 0$ , find the *first two nonzero terms* in a power series representation for  $\frac{\sin(x)-x}{x^3}$ . Again, try visiting your happy place.

2

(c) Use the above result to find the *numerical value* of the limit

$$\lim_{x \rightarrow 0} \frac{\sin(x) - x}{x^3}.$$