Opening Boards

1. Assume $s(6) = 4$ and $s'(6) = \frac{3}{2}$. Write an equation (in Taylor form) for $t(x)$, the line tangent to $s(x)$ at $x = 6$.
2. Recall "the limit of a sum is the sum of the limits"
   (a) What does this statement mean?
   (b) Show how to use a difference quotient to proof that:
   $$\text{if } s(x) = f(x) + g(x) \text{ then } s'(x) = f'(x) + g'(x)$$
   (c) State this result in English.
3. Show how to use a difference quotient to proof that:
   $$\text{if } l(x) = k \cdot f(x) \text{ and } k \text{ is a constant, then } l'(x) = k \cdot f'(x)$$
   State this result in English.

Sneaking Up on $\frac{\sin 0}{0}$

Recall we showed that
$$\lim_{\theta \to 0^+} \frac{\sin\theta}{\theta}$$

4. Use a unit circle to observe that $\sin(x)$ is an *odd function.* (How would you explain this to our our inquisitive 8th grader?)
5. Use our limit from the positive side $\lim_{x \to 0^+} \frac{\sin x}{x}$ and the symmetry of $\sin(x)$ to show:
   $$\lim_{x \to 0^-} \frac{\sin x}{x}$$
   Hint: Let $u = -x$ with known limit..
6. Demonstrate how to use a difference quotient to find $\sin'(0)$.
7. Consider the function $f(x) = \frac{\sin x}{x}$.
   (a) Is $f(x)$ *continuous* at $x = 0$? Explain.
   (b) Does $f(x)$ have any symmetry (e.g. even, odd)? Explain