Homework 1 feedback

16/20

1. (1/2) $f(-x)$ should be $e^{(-x)^2}\sin(4(-x)) = e^{x^2}(-\sin(4x))$. It seems that inputting $-x$ into the sine term was neglected.

2. (1/2) For (c), $\sin(x)$ does not pass the horizontal line test on the domain $[0, \pi]$, but only the domain $[0, \pi/2]$.
   For (d), $\frac{1}{1+x^2}$ *does* pass the horizontal line test on the domain $[0, \infty)$ although it fails the horizontal line test on $(-\infty, \infty)$.

3. Good!

4. Good!

5. (1.5/2) For (d), I don't understand why $\lim_{x\to 1}\sin(x) \approx 0.0174524$. When I compute it, I get $0.84147\cdots$. The limit should just evaluate "as-is" to $\frac{\sin(\sin(1))}{\sin(1)}$, because nothing "goes wrong".

6. Good!

7. (1.5/2) For (c), there is definitely a discontinuity at $x = 3$, because there is no term in the numerator $x^4 + x^2 + 5x$ to "cancel out" with $x - 3$. Thus, as x gets closer and closer to 3, $\frac{x^4+x^2+5x}{x-3}$ will approach $+\infty$ (from the right) or $-\infty$ (from the left).

8. (1/2) The question asked for proof that there is *more* than one root; to get full credit, we need evidence that the function changes sign twice or more. This requires checking points inside the interval, not just the endpoints. For example, one has $f(-2) > 0$, $f(-1.5) < 0$, and so by the IVT there is a root between $-2, -1.5$. Then, $f(1) > 0$ and $f(2) < 0$, and so there is another root between 1 and 2. Thus there is more than one root.

9. For (b): there is no penalty for this, because the problem actually had a typo in it (and so with the function I gave, there actually was no root); however, it is not true that $f(-1) < 0$ and $f(1) > 0$, and so the IVT does not apply.