Quiz 5

Fall 2016

MATH 221

Name: _____

For full credit please explain all of your answers. **No calculators** are allowed.

Problem 1. Find the derivative of the following function:

$$\tan^3(\sqrt{\sin(7x)})$$

Solution 1.

This is just like the worksheet problem. Applying the chain rule we find

$$\frac{d}{dx}(\tan^3(\sqrt{\sin(7x)})) = 3\tan^2(\sqrt{\sin(7x)}) \cdot \sec^2(\sqrt{\sin(7x)})) \cdot \frac{1}{2}(\sin(7x)^{-1/2}) \cdot \cos(7x) \cdot 7$$

□

Problem 2. Compute all asymptotes (horizontal, vertical, slant) of the following function. Explain your work:

$$\frac{x-1}{x^2-1}$$

Solution 2.

Notice the degree of the denominator is one higher than the degree of the numerator so

$$\lim_{x\to\pm\infty} \frac{x-1}{x^2-1} = \lim_{x\to\pm\infty} \frac{1}{x+1} = 0$$

So we have a horizontal asymptotes at $y = 0$. This implies there are no slant asymptotes. We have to be careful with the vertical asymptotes because it's tempting to set the denominator equal to zero and claim all of these points are vertical asymptotes, but this need not be the case. Here we have a vertical asymptotes at $x = -1$, and a HOLE at $x = 1$ because the numerator is also zero. To see this take the limits as you approach these points. As you go to -1 the function goes to $\pm\infty$ but as you approach 1 this goes to the value $1/2$.

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