

This is the first exam for Calculus I last fall.

1. (15 points) Find all vertical and horizontal asymptotes for the following function.

$$f(x) = \frac{(x-1)(x-2)}{(x^2-4x+4)}$$

2. (15 points) For the function $g(x)$ below, use the formal definition of the derivative—meaning the difference equation—to find the derivative $g'(x)$.

$$g(x) = 4x^2 + 1$$

3. (10 points) (Not applicable to this class; it was a ‘sketch the derivative’ problem.)

4. (10 points) Let $f(x) = \sin(x) + 2$. (Adding the ‘2’ lifts up the graph of $\sin(x)$ by 2.) Find the equation of the tangent line to the graph of f at the point $c = 0$.

5. (20 points) Find the first derivative:

$$h(x) = x^{25}e^{\tan(x)}$$

6. (20 points) Find the first derivative:

$$g(x) = \frac{e^x}{\ln(x)}$$

7. (10 points) Find the second derivative:

$$f(x) = \sin(x^2)$$

Extra Credit. (5 points) Tricky? For $x > 0$, what is the derivative of the function below?

$$g(x) = x^x$$