MAT125A Fall 2014
Practice Midterm II

The actual exam will consist of six problems.

Problem 1

Compute the following limits. Please distinguish between "limit is equal to ∞", "limit is equal to $-\infty$" and "the limit doesn't exist even allowing for infinite values":

1. $\lim_{x\to\infty} \frac{x^3+2x+1}{2x^3-15x}$
2. $\lim_{x\to 2-} \frac{x^2-2x-3}{x^2-5x+6}$
3. $\lim_{x\to 3+} \frac{x^2-2x-3}{x^2-5x+6}$
4. $\lim_{x\to\infty} \frac{1}{e^{(x^2)}+1}$
5. $\lim_{x\to -1^+} \tan^{-1}(\frac{1-x}{1+x})$
6. $\lim_{x\to +\infty} \frac{\sin^{-1}(\frac{1-x}{1+x})}{\cos^{-1}(\frac{1-x}{1+x})}$
7. $\lim_{x\to 0} \frac{\sin(2x)^2}{x^2}$

Problem 2 Find horizontal and vertical asymptotes of

1. $y = \frac{x^3+2x+1}{2x^3-32x}$
2. $y = \frac{x^2-2x-3}{x^2-5x+6}$
3. $y = \frac{1}{e^{x^2}+1}$
4. $y = \frac{\sin(2x)^2}{x^2}$

Problem 3

Find the derivative of each function

1. $\frac{1}{x^5}$

2. $\cos(x)$
3. e^x
4. x^2e^x
5. $\tan(1+x^2)$
6. $(\sin(x))^2$
7. $\cos(xe^x))$
8. $\frac{\cos(x^2)}{x^2}$
9. $\sqrt{\sin(\frac{1}{x^2})}$
10. $\frac{1}{\sin^{-1}(x)}$
11. $\tan^{-1}(\sqrt{x})$

Problem 4

1. Compute $\sin\left(\tan^{-1}(2)\right)$
2. Simplify $\cos\left(2\sin^{-1}(x)\right)$

Problem 5

Find an equation for the tangent line to the curve

$$y = \sin(x) - 5x + 3 \text{ at the point } (0, 3)$$

Problem 6

Find the first and second derivatives of the following functions.

1. $f(x) = x^4 + 7x + 3e^{x^3}$
2. $g(x) = \cos(x^4)$

Problem 7

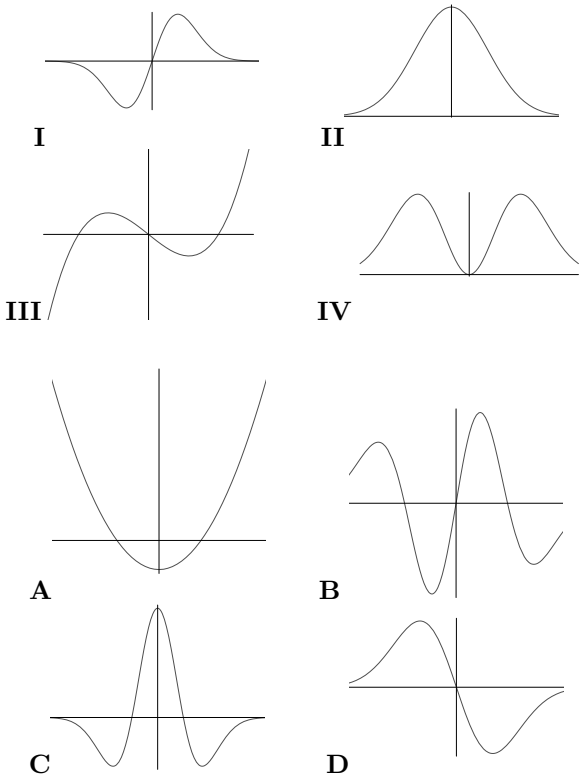
Consider the function $y = f(x)$ defined implicitly by the equation

$$xy + x^2y^3 = 10$$

, such that $f(1) = 2$. Find $f'(1)$ and $f''(1)$.

Problem 8

Match the graphs of functions **I**–**IV** below with the graphs of their derivatives **A**–**D**. (Justification is not required.)



Problem 9

1. Suppose $f(x) = \sin(x)g(x)$. Compute $f''(\pi/3)$ if $g(\pi/3) = g'(\pi/3) = g''(\pi/3) = 4$
2. $F(x) = G(H(x))$. Compute $F'(2)$ if $H(2) = 3, H'(2) = 9, H(3) = 2, H'(3) = 1/9, G(2) = 1/3, G'(2) = 1/9, G(3) = 2, G'(3) = 9,$