

Math 111 – Fall 2014
Examination 2

Please complete the following problems. All work must be shown in order to receive full credit. Answers without explanation will receive *no* credit. The use of books, notes, calculators, or any other external sources of information is not allowed during this examination.

1.(15 pts.) Find $y'(x)$ for the following:

a. $y = \sqrt{4x^2 + \sec^2(3x)}$

b. $y = \frac{4^x}{\log_4(x)}$

c. $y = \cos^2(\sin^2(5x))$

2.(15 pts.) Find $y'(x)$ for the following:

a. $y = x \arctan(x^2)$

b. $y = \frac{1}{\arcsin(2x)} + \cot(2x)$

c. $y = \frac{x^\pi + \pi^\pi}{\pi^x + \pi^\pi}$

3.(10 pts.) Find $y'(x)$ for the following:

a. $y = \ln(2 \tan^2(3x))$

b. $y = x^{\sqrt{x}}$

4.(10 pts.) Find $y'(x)$ for the following:

a. $y = \ln\left(\frac{x^3}{\sqrt{x^3 + 7}}\right)$

b. $y = e^x + e^y + e^{xy} + e$

5.(8 pts.) Find $\frac{d^{250}y}{dx^{250}}$ for $y = \ln(x)$.

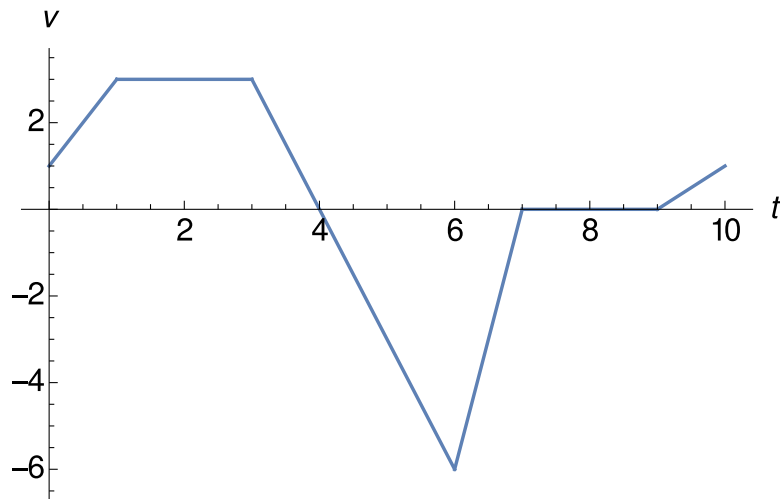
6.(16 pts.) This question is about tangents and normals to curves.

a. Find the tangent line to $y = \tan(x) \sec(x)$ at $x = \frac{\pi}{3}$.

b. Find the normal line to $y = \sqrt{x-1} - \frac{1}{x}$ at $x = 2$.

7.(12 pts.) Oil spilled from a ruptured tanker spreads in a circular pattern whose area increases at a constant rate of $6 \text{ km}^2/\text{hr}$. How fast is the radius of the spill increasing when the area is $9\pi \text{ km}^2$?

8.(14 pts.) The figure below shows the velocity v of a particle moving on a horizontal coordinate line.



- When does the particle move forward?
- When is the particle not moving?
- When does the particle move backward?
- When is the particle's acceleration positive?
- When is the particle's acceleration zero?
- When is the particle's acceleration negative?
- When does the particle move at its greatest speed?