Math 124 **Sample Midterm 1 Exam** **Autumn 2016**

Your Name (print) _____

Your Signature _____

Student I.D.# | | | | | | | | **Quiz Section** | | |

• Turn in your exam when you are finished. Do not leave the room until the examination is completed. You will lose credit if you leave early.

• Turn off all electronic devices. If your phone rings accidentally, you must ask for permission to turn it off.

• This exam is closed book. You may use one 8.5x11 sheet of handwritten notes (one side), but the notes cannot include completely worked problems.

• The only calculator allowed is the TI-30x IIS.

• In order to receive credit you must show all of your work. Show enough work that the grader can determine what you did to arrive at your answers. Correct answers without justification may not receive much credit.

• If you need more room, use the backs of the pages, but **clearly** indicate you have done so.

Place a box ☐ **around your answer whenever that is appropriate.**

Score

1.	(10)	
2.	(30)	
3.	(30)	
4.	(30)	
Total	(100)	

1.(10) Compute the derivative of the following function. You need not simplify your answer.

$$f(x) = \cos^2(\tan(e^{3x-1}))$$

2. (30) You can use limits, but do not use differentiation rules in this problem. Show all of your work to receive credit.

Find the equation of the line which is tangent to the graph of

$$f(x) = \frac{54}{\sqrt{2x-3}}$$

at the point $(6, f(6))$. Your answer should not contain the symbol f.

3. a.(15) You may use differentiation rules in this problem. Find the slope of the graph of

$$g(x) = e^{-3x+4} \tan\left[2(x-1) + \frac{\pi}{6}\right]$$

at the point $(1, g(1))$.

b.(15) Compute

$$\lim_{x \to 0} \frac{e^x - 1}{x^2 \sin\left(\frac{1}{x}\right) + 2x}.$$

Hint: You can use a derivative to find the limit of a difference quotient.

4. Let $f(x) = x^3 - 20x^2 + 5$.

a.(4) True or False: there is a number x in the interval $(0, 1)$ with $f(x) = 0$. You must give a valid reason to get credit (if you use a Theorem, state the name of the Theorem, and state why the hypotheses of the Theorem hold).

b.(4) For which interval: $(0, 1/2)$ or $(1/2, 1)$ can you be certain that there is an x in the interval with $f(x) = 0$? Give a valid reason.

c.(11) Find the equation of the line which is tangent to the curve $y = f(x)$ when $x = 1/2$.

d.(11) Use your answer to part c to find a number x where $f(x)$ is approximately equal to 0. The number $1/2$ will not be accepted. You should give a better answer. Hint: the tangent line in part c is approximately the same as the curve near $x = 1/2$.