Math 12002	Analytic Geometry and Calc I	Fall 2016
December 8, 2016	Exam 5	Matt Alexander

Name: _____ Score: _____/100

Please show **all** your work! Answers without supporting work will not be given credit. Write answers in spaces provided. You have 50 minutes to complete this exam.

1. (6 points) Let $f(x) = e^{4x} + \arccos x$. Find the equation of the tangent line to the graph of f at the point $(0, 1)$.

Answer: _____

2. (6 points) Let $g(x) = x^3 e^x$. Determine the intervals where g is increasing and the intervals where g is decreasing.

Answer: _____

3. (6 points) Let $h(x) = xe^x$. Determine the intervals where h is concave up and the intervals where h is concave down.

Answer: _____

4. (24 points) Find the derivatives of the following functions. DO NOT SIMPLIFY YOUR ANSWERS.

(a) $f(x) = \sec^{-1} x + \dfrac{1}{x} + e^{-4x}$

Answer:_____

(b) $f(x) = \ln(\cos(5x))$

Answer:_____

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

Answer:_____

(d) $f(x) = \dfrac{\arcsin(x^2+2)}{x^5+e^x}$

Answer:_____

Cont.

5. (30 points) Compute the following indefinite integrals.

(a) $\int (\sin x) e^{2+3\cos x}\, dx$

Answer:_____

(b) $\int \dfrac{x^4+2}{x^5+10x+8}\, dx$

Answer:_____

(c) $\int \dfrac{\ln x}{x}\, dx$

Answer:_____

(d) $\int \dfrac{1}{\sqrt{5-125x^2}}\, dx$

Answer:_____

Cont.

6. (6 points) Compute the definite integral $\displaystyle\int_0^{\ln 2} \frac{e^x}{e^x+3}\,dx$.

Answer:_____

7. (6 points) Use logarithmic differentiation to find the derivative of $f(x) = x^{x^2+5x}$

Answer:_____

8. (8 points) Evaluate the following limits. JUSTIFY YOUR ANSWERS.

   (a) $\displaystyle\lim_{x\to 0} \frac{1-e^x}{5x+8\sin(x)}$

Answer:_____

Cont.

(b) $\lim_{x\to 0} \dfrac{\cos(x)-1}{\sin(x)+1}$

Answer:_____

(c) $\lim_{x\to \infty} \dfrac{5e^{2x}}{x+e^{2x}}$

Answer:_____

9. (8 points) Use L'Hôpital's rule to calculate the following limits.

(a) $\lim_{x\to 0^+} x\ln(x)$

Answer:_____

(b) Use part (a) to compute $\lim_{x\to 0^+} x^x$

Answer:_____

The End.