Math 31 Unit 4 Exam

23 May 2008 Name _____

[marks]

1. Solve each equation. State your answer **exactly** and also to **5 decimal places**.

a) $\ln(2x - 3) = \frac{5}{2}$

[4]

	exact value	value to 5 decimal places
x		

b) $e^{5-3x} = 6$

	exact value	value to 5 decimal places
x		

2. Express as a single logarithm:

a) $3\ln(x - 5) - 2\ln(2 - 3x) + \ln(x + 1)$

[4]

b) $\frac{1}{2}\ln(2x - 1) - \frac{1}{3}\ln(x^2 - 3x + 5)$

3. Differentiate y with respect to x.

a) $y = \dfrac{e^{3x}}{x^2 - 4}$

b) $y = e^{\tan(\sqrt{x})}$

[18]

c) $y = \dfrac{\ln x}{x^3}$

d) $y = \ln\sqrt{\dfrac{3x + 5}{2x - 1}}$

e) $y = \log_5(2x^2 + 5x + 2)$

f) $y = x^6 + 6^x$

4. Use logarithmic differentiation to find the derivative of each:

a) $x^4 e^x \sqrt{x^2 + 2x - 3}$

[9]

b) $y = \dfrac{x\sqrt{2x + 8}}{(x^3 - 2)(2x + 3)}$

c) $y = (\sin x)^{\cos x}$

5. The initial count in a bacteria culture was 800. After 1 h it was 3200.
   a) Determine the function which expresses the bacterial culture population, P, as a function of the time, t, in hours.

[4]

   b) Find the rate of growth after 15 min.

6. Given that $\frac{dy}{dx} = 6x^2 - 15$, find the (antiderivative) function, y, if $y = 0$ when $x = 2$.

[3]

7. An object moves in a straight line with velocity $v = 4t - 6t^2$ with v being measured in metres per second and t is time in seconds.

a) How far does the object move in the first second?

[3]

b) How far does the object move in the first 3 seconds?

[45] total marks