Quiz 7

Spring 2016

MATH 222-004

Name: _____

For full credit please explain all of your answers. **No calculators** are allowed.

Problem 1. A philanthropist endows a chair. This means that she donates $\$1,000,000$ to the university. The university invests the money (it earns compounded continuously interest). Denote the interest rate on the investment by r (e.g. if r=.06, then the investment earns interest at a rate of 6% compounded continuously) and the balance in the investment account at time t by $B(t)$.

Write and solve a differential equation for $B(t)$ using the initial condition.

Solution 1.

We've seen this a few times before. Whenever we have interest compounded continuously we know the final solution will be $B(t) = 1000000e^{rt}$. The differential equation is $\frac{dB}{dt} = rB$ with $B(0) = 1000000$ □

Problem 2. Compute $T_0^{e^2} f(x), T_1^{e^2} f(x), T_2^{e^2} f(x)$ for $f(x) = \ln(x)$.

Solution 2.

By definition we know $T_0^{e^2} f(x) = f(e^2) = 2$, $T_1^{e^2} f(x) = f(e^2) + f'(e^2)(x - e^2) = 2 + \frac{1}{e^2}(x - e^2)$. Finally,

$$T_2^{e^2} f(x) = f(e^2) + f'(e^2)(x - e^2) + \frac{f''(e^2)}{2!}(x - e^2)^2 = 2 + \frac{1}{e^2}(x - e^2) - \frac{1}{2e^4}(x - e^2)^2$$

□