Practice Test 4
BUSA130

This exam is graded out of 15 points. You must do Problems 1 and 2. You may choose 5 of the remaining 6 problems.

1) This word problem yields the equation

$$1.75 = e^{0.05t},$$

which must be solved for t. This gives

$$\ln(1.75) = 0.05t \implies t = \frac{\ln(1.75)}{0.05} \approx 11.19.$$

2) This word problem yields the equation

$$150 = 100\left(1 + \frac{r}{4}\right)^{4(3.5)},$$

which must be solved for r. This gives

$$\ln(1.5) = 14\ln\left(1 + \frac{r}{4}\right) \implies \ln\left(1 + \frac{r}{4}\right) = \frac{\ln(1.5)}{14},$$

then raising e to both sides of the equation, we get

$$1 + \frac{r}{4} = e^{\frac{\ln(1.5)}{14}} \implies r = 4\left(e^{\frac{\ln(1.5)}{14}} - 1\right) \approx 0.11754.$$

3) We first take the natural logarithm of both sides, getting $\ln f = \ln(3x^2(x^2+1)^5(x-1)^2) = \ln 3 + \ln x^2 + \ln(x^2+1)^5 + \ln(x-1)^2 = \ln 3 + 2\ln x + 5\ln(x^2+1) + 2\ln(x-1)$. And differentiating, we get

$$\frac{f'}{f} = \frac{2}{x} + \frac{10x}{x^2+1} + \frac{2}{x-1} \implies f'(x) = (3x^2(x^2+1)^5(x-1)^2)\left(\frac{2}{x} + \frac{10x}{x^2+1} + \frac{2}{x-1}\right).$$

4) We need the derivative of $f(x) = e^{0.5x^2-x}$, which is $f'(x) = (x-1)e^{0.5x^2-x}$, getting the critical value $x = 1$. Thus, we test $f(0)$, $f(1)$, and $f(5)$, and we find that the maximum value occurs at $f(5)$ and the maximum value is approximately 1808.04.
5) This problem yields an initial value differential equation: $s'(t) = t + 2$, $C(0) = 2$. Integrating, we get the general solution $s(t) = 0.5t + 2t + C$, and using the initial condition, we see that $C = 2$, so our particular solution is $s(t) = 0.5t + 2t + 2$, so $s(4) = 8$.

6) Well, you can evaluate this integral using the generalized power rule for integrals or by using u-substitution. We get $\int_0^1 2x(x^2+1)^4 \, dx = \frac{(x^2+1)^5}{5}\Big|_0^1 = 6.4 - 0.2 = 6.2$.

7) This means we must calculate the definite integral $\int_1^2 (x^2+1) \, dx = \frac{x^3}{3} + x\Big|_1^2 =$ 3.333.

8) We have $\Delta x = 0.25$, so we approximate the area by

$$0.25\left[f(2.125) + f(2.375) + f(2.625) + f(2.875)\right] \approx 0.979.$$

Bonus: There will be a bonus question worth 0.5pts.