Math 135, Quiz #10 Solutions

Name: ____________________ Section: ____________________

Instructions: Show all your work in order to receive proper credit. No formula sheets and no notes are allowed during the quiz. No cell phones, calculators, or any other electronic devices are allowed in a student's possession during any quiz. All such devices must be put away in the student's bag, out of reach of the student during the quiz. Quiz should be completed in one seating with no breaks. Box your final answer. Good luck!
Timing: 15 minutes

1. **(3 pts)** Evaluate the integral. **Simplify your final answer as much as possible.**

$$\int_1^8 (2 + \frac{1}{x} - 4\sqrt[3]{x})\ dx$$

Solution: By using the first fundamental theorem of calculus, we obtain:

$$\int_1^8 (2 + \frac{1}{x} - 4\sqrt[3]{x})\ dx = \left(2x + \ln|x| - 3x^{4/3}\right)\Big|_1^8 = (16 + \ln(8) - 3\cdot(2^3)^{4/3}) - (2 - \ln(1) - 3) = ln8 - 31$$

2. **(3 pts)** Evaluate the integral. **Simplify your final answer as much as possible.**

$$\int_0^{\pi} e^{\cos t}\sin t\ dt$$

Solution:

Let $u = \cos t$, then $du = -\sin t \cdot dt$ and $-du = \sin t \cdot dt$
Then we substitute u and du in the given integrand after changing the limits of integration respectively as:

$$t = \pi \Longrightarrow \cos(\pi) = -1$$
$$t = 0 \Longrightarrow \cos(0) = 1$$

$$\int_0^{\pi} e^{\cos t}\sin t\ dt = \int_1^{-1} e^u \cdot\ (-du) = (-e^u)\Big|_1^{-1} = -e^{-1} - (-e^1) = -\frac{1}{e} + e$$

3. **(4 pts)** Find the area of the region under the the graph of $y = \frac{e^{\sqrt{t}}}{\sqrt{t}}$ above the $t-$axis on the interval of $[4, 25]$. **Simplify your final answer as much as possible.**

Solution:
Let $u = \sqrt{t} = t^{1/2}$. Then $du = \frac{1}{2} \cdot t^{-1/2} \cdot \ dt$. Therefore, the remaining integrand $\frac{dt}{\sqrt{t}} = 2 \cdot \ du$.
Then, we substitute u and $2du$ in the given integrand after changing the limits of integration respectively as:

$$t = 25 \Longrightarrow \sqrt{25} = 5 = u$$
$$t = 4 \Longrightarrow \sqrt{4} = 2 = u$$

$$A = \int_4^{25} \frac{e^{\sqrt{t}}}{\sqrt{t}} \ dt = \int_2^5 2e^u \ du = (2e^u)\Big|_2^5 = 2e^5 - 2e^2$$