Exam 1a   **Calculus 2**   **2/2/24**

Each problem is worth 10 points. For full credit provide good justification for your answers.

1. Evaluate $\displaystyle\int \sin^4\theta\cos\theta\,d\theta$

2. Evaluate $\displaystyle\int xe^x\,dx$

3. Write the appropriate form for a partial fractions decomposition of the function

$$\frac{2(x+1)}{(x-2)^2(x-1)^2(x^2+2)^2}$$

4. Evaluate $\displaystyle \int_{e}^{e^5} \frac{dx}{x\sqrt{\ln x}}$

5. Evaluate $\displaystyle\int_{3}^{\infty} e^{p/2}\, dp$

6. Evaluate $\displaystyle\int \frac{x^3}{\sqrt{1-x^2}}\,dx$

7. Star is a calculus student at Enormous State University, and they're having some trouble. Star says "Yikes! Calc 2 is like a totally different thing than Calc 1. These problems are so long! And sometimes I wonder why they pick the things they do, like for a trig sub one, why do they do $x = \sin\theta$? Would it work if you did $x = \cos\theta$?"

Help Star out. Explain to them as clearly as possible whether their alternative works well, and why.

8. Derive Line 87 from the Table of Integrals,

$$\int \sin^{-1} u \, du = u \sin^{-1} u + \sqrt{1 - u^2} + C$$

9. Derive Line 30 from the Table of Integrals,

$$\int \sqrt{a^2 - u^2}\, du = \frac{u}{2}\sqrt{a^2 - u^2} + \frac{a^2}{2}\sin^{-1}\frac{u}{a} + C$$

10. Evaluate $\displaystyle\int \frac{1}{1+x^3}\,dx$ [Hint: $1 + x^3 = (1+x)(1 - x + x^2)$]

Extra Credit [5 points possible]: Evaluate $\displaystyle\int \frac{x^2}{\sqrt{1-x}}\, dx$