

Name \_\_\_\_\_

2023  
OSSM Integration Bee  
Qualifying Exam

Instructions:

1. You will have 30 minutes to solve as many of these ten integrals as you can.
2. Circle your answer for each integral.
3. Answers to definite integrals should be a number or numerical expression (need not be simplified). Answers to indefinite integrals can be any function which is a valid antiderivative (need not be simplified); the "+C" (plus a constant) is optional.
4. An answer that is a function must be written in terms of the same variable from the original integral!

$$1. \quad \int_0^1 (2-t)\sqrt{t} \, dt$$

$$2. \quad \int_1^9 \frac{1}{\sqrt{x}(1+\sqrt{x})^2} \, dx$$

$$3. \quad \int_{-1}^2 |x-1| \, dx$$

$$4. \quad \int_0^2 \frac{x^2-2}{x+1} \, dx$$

5.  $\int \frac{4}{1+9x^2} dx$

6.  $\int \frac{1}{\sqrt{-3-4x-x^2}} dx$

7.  $\int x e^x dx$

8.  $\int \tan(x) [\ln(\cos(x))] dx$

9.  $\int \frac{x-3}{x^2+1} dx$

10.  $\int \frac{3}{x^2+x-2} dx$

$$1. \frac{14}{15}; \text{power rule}$$

$$2. \frac{1}{2}; \text{u-substitution}$$

$$3. \frac{5}{2}; \text{geometry}$$

$$4. -\ln(3); \text{division}$$

$$5. \frac{4}{3} \tan^{-1}(3x) + C; \text{inverse trig with u-sub}$$

$$6. \sin^{-1}(x+2) + C; \text{complete the square}$$

$$7. xe^x - e^x + C; \text{parts}$$

$$8. -\frac{[\ln(\cos(x))]^2}{2} + C; \text{u-sub}$$

$$9. \frac{1}{2} \ln(x^2+1) - 3 \tan^{-1}(x) + C; \text{split}$$

$$10. \ln \left| \frac{x-1}{x+2} \right| + C; \text{decomposition}$$