

FOR MATH 222 STUDENTS

SECTION #: _____

NAME: KEY

E-MAIL: _____

CIRCLE ONE:

GRADUATE

UNDERGRADUATE

Integration

Bee

2.00.8

No: calculators, books, notes, headphones,
personal electronic devices, funny T-shirts,
wireless cerebral interfaces; cheating

60 minutes. Circle answers. no partial credit
all problems count equally. start and stop when told

Top 10 scorers advance to finals

Highest performing Math 222 section gets ice cream

$$1. \int x^{2008} dx$$

$$\frac{x^{2009}}{2009}$$

$$2. \int \sqrt{x+1} dx$$

$$\frac{2}{3}(x+1)^{3/2}$$

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

$$x - \ln|x+2|$$

$$4. \int \cot x dx$$

$$\ln|\sec x|$$

$$5. \int (x+4)^5 dx$$

$$\frac{(x+4)^6}{6}$$

$$6. \int \frac{dx}{x^2+4} dx$$

$$\frac{1}{2} \tan^{-1} \frac{x}{2}$$

OR

$$\frac{1}{2} \ln|x^2+4|$$

$$7. \int \ln(x^{12}) dx$$

$$12 (x \ln x - x)$$

$$8. \int \frac{3x+2}{3x^2+4x+5} dx$$

$$\frac{1}{2} \ln |3x^2+4x+5|$$

$$9. \int \frac{x+2}{3x^2+4x+5} dx$$

$$\frac{1}{6} \ln \left| \frac{9}{11} \left(x + \frac{2}{3} \right)^2 + 1 \right| + \frac{4}{3\sqrt{11}} \text{TAN}^{-1} \left(\frac{3x}{\sqrt{11}} \right)$$
$$\frac{1}{6} \ln \left| \frac{9}{11} x^2 + \frac{12}{11} x + \frac{15}{11} \right| + \frac{4}{3\sqrt{11}} \text{TAN}^{-1} \left(\frac{3x+2}{\sqrt{11}} \right)$$
$$\frac{1}{6} \ln |3x^2+4x+5| + \frac{4}{3\sqrt{11}} \text{TAN}^{-1} \left(\frac{3x+2}{\sqrt{11}} \right)$$

$$10. \int x e^x dx$$

$$x e^x - e^x$$

$$11. \int \frac{x}{(1+x)^2} e^x dx$$

$$\frac{e^x}{1+x}$$

$$12. \int \cos x e^x dx$$

$$\frac{e^x}{2} (\sin x + \cos x)$$

$$13. \int 1+x(1+x(1+x(1+x))) dx \quad x + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + \frac{x^5}{5}$$

$$14. \int \sin(\cos^{-1} x) dx \quad \frac{1}{2} [\sin^{-1} x + x\sqrt{1-x^2}]$$

$$-\frac{1}{2} \cos^{-1} x + \frac{1}{4} \sin 2(\cos^{-1} x)$$

$$15. \int \sin(\cos^{-1}(\sin(\cos^{-1} x))) dx \quad \frac{x^2}{2}$$

$$16. \int \sqrt{(\sqrt{(\sqrt{(x+1)^2})^2})^2} dx \quad \frac{(x+1)^2}{2} \quad \frac{x^2}{2} + x$$

$$17. \int \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1+x}}}} dx \quad \frac{2}{3} x - \frac{1}{9} \ln(x + \frac{5}{3})$$

$$18. \int \sqrt{\sqrt{\sqrt{x}}} dx \quad \frac{16}{17} x^{17/16}$$

$$21. \int \cos 3x \, dx \quad \frac{1}{3} \sin 3x$$

$$22. \int \sec^3 x \, dx \quad \frac{1}{2} \sec \theta \tan \theta + \frac{1}{2} \ln \left(\tan \left(\frac{\theta}{2} + \frac{\pi}{4} \right) \right)$$

$$\frac{1}{2} \sec \theta \tan \theta + \frac{1}{2} \ln |\tan \theta + \sec \theta|$$

$$\frac{1}{2} \sec \theta \tan \theta + \frac{1}{2} \sinh^{-1}(\tan \theta)$$

$$23. \int \sin^3 x \, dx \quad -\frac{\cos x (\sin^2 x + 2)}{3}$$

$$\frac{1}{4} \left(\frac{\cos 3x}{3} - 3 \cos x \right)$$

$$\frac{\cos^3 x}{3} - \cos x$$

$$24. \int \sin^{-1} x \, dx \quad x \sin^{-1} x + \sqrt{1-x^2}$$

$$25. \int \tan^3 x + \tan^5 x \, dx \quad \frac{\tan^4 x}{4}$$

$$\frac{\sec^4}{4} - \frac{\sec^2}{2}$$

$$26. \int \frac{\sqrt[3]{\tan^2 x}}{\cos^2 x} \, dx \quad \frac{3}{5} (\tan x)^{5/3}$$

$$27. \int \frac{7}{(7+7x)^{1/7}} dx \quad \frac{7}{6} (7+7x)^{6/7}$$

$$28. \int \frac{\log x}{x} dx \quad \frac{1}{2} (\log x)^2$$

$$29. \int \frac{1}{x \log x} dx \quad \log(\log x)$$

$$30. \int \frac{1}{x (\log x)^{2008}} dx \quad -\frac{1}{2007} (\log x)^{-2007}$$

$$31. \int \sin(\log x) dx \quad \frac{1}{2} x (\sin(\log x) - \cos(\log x))$$

$$32. \int \log(x^2 + 2241) dx \quad x \log(x^2 + 2241) - 2x + 2\sqrt{2241} \tan^{-1} \frac{x}{\sqrt{2241}}$$

$$33. \int \frac{x}{\cos^2 x} dx \quad x \tan x + \log \cos x$$

$$34. \int \frac{x}{\sin^2 x} dx \quad -x \cot x + \log \frac{\sin x}{\cos x}$$

$$35. \int x^3 \cos x dx \quad (3x^2 - 6) \cos x + (x^3 - 6x) \sin x$$

$$36. \int \frac{\tan x}{\sqrt{1 - \frac{\pi}{4} \sin^2 x}} dx \quad \frac{1}{2(1 - \frac{\pi}{4})^{1/2}} \log \left| \frac{\sqrt{1 - \frac{\pi}{4} \sin^2 x} + \sqrt{1 - \frac{\pi}{4}}}{\sqrt{1 - \frac{\pi}{4} \sin^2 x} - \sqrt{1 - \frac{\pi}{4}}} \right|$$

$$37. \int \frac{\sin x \cos x}{22 \cos^2 x + 41 \sin^2 x} dx \quad \frac{1}{38} \log |22 \cos^2 x + 41 \sin^2 x|$$

38. WRITE IN YOUR FAVORITE INTEGRAL AND SOLVE IT:

$$39. \int \frac{d\theta}{1+\cos\theta}$$

$$-\cot\theta + \csc\theta$$

$$\frac{1-\cos\theta}{\sin\theta}$$

$$\frac{\sin\theta}{1+\cos\theta}$$

$$\frac{\sin\frac{\theta}{2}}{\cos\frac{\theta}{2}}$$

$$40. \int \frac{1-\cos\theta + \sin\theta}{\sin\theta + 1 + \cos\theta} d\theta$$

$$-\ln|1+\cos\theta|$$

$$-2\ln|\cos\frac{\theta}{2}|$$

$$41. \int e^{\ln(e^x)} dx$$

$$e^x$$

$$42. \int \ln(e^{\ln(e^{\ln(e^{\ln(e^x)})})}) dx$$

$$\frac{x^2}{2}$$

$$43. \int e^{\pi i} di$$

$$\frac{1}{\pi} e^{\pi i}$$

$$44. \int \left(1 + \frac{d}{dx} \left[\sin^{-1}(2x-1) - \sin^{-1}(2\sqrt{x-x^2}) \right] \right)^2 dx$$

x

$$45. \int \frac{3x^2 + 2}{x^{2/3}} dx \quad \frac{9}{7} x^{7/3} + 6x^{1/3}$$

$$46. \int \frac{dx}{\sqrt{x-x^2}} \quad \begin{aligned} & 2 \sin^{-1} \sqrt{x} \\ & \sin^{-1}(2x-1) - \sin^{-1}(1-2x) \\ & \sin^{-1}(2\sqrt{x-x^2}) \\ & -2 \sin^{-1} \sqrt{1-x} \end{aligned}$$

$$47. \int \frac{dx}{(1+\sqrt{x})(\sqrt{x-x^2})} \quad \begin{aligned} & -2 \sqrt{\frac{1-\sqrt{x}}{1+\sqrt{x}}} \\ & -2 \sqrt{\frac{1-x}{1+x}} \end{aligned}$$

$$48. \int \frac{x^{2008}}{\sqrt{1-x^{4018}}} dx \quad \frac{1}{2009} \sin^{-1} x^{2009}$$

$$49. \int \frac{x^2}{1+3x} dx \quad \frac{1}{27} \left[\frac{1}{2} (1+3x)^2 - 2(1+3x) + \log|1+3x| \right]$$

$$\frac{1}{27} \left[-\frac{3}{2} - 3x + \frac{9x^2}{2} + \log|1+3x| \right]$$

$$-\frac{1}{18} - \frac{x}{9} + \frac{x^2}{6} + \frac{\log|1+3x|}{27}$$

$$50. \int \frac{1}{(1-x)\sqrt{1-x^2}} dx \quad \begin{aligned} & \sqrt{\frac{1+x}{1-x}} \\ & \frac{1+x}{\sqrt{1-x^2}} \\ & \text{TAN}(\sin^{-1} x) + \text{SEC}(\sin^{-1} x) \end{aligned}$$