

Math 142 – Summer 2003
Exam # 2– Show All Work

1. (a). Evaluate: $\lim_{x \rightarrow 0} \frac{x \sin 2x}{x \sin 3x} =$ _____

(b). Evaluate: $\lim_{x \rightarrow 0} \left[\ln(8x^2 + 3x + 1) - \ln(2x^2 - 7x + 1) \right] =$ _____

2. Evaluate: $\int \frac{1}{\sqrt{x}(1+x)} dx =$ _____

3. Evaluate: $\int \frac{\sqrt{x^2 - 9}}{x^2} dx =$ _____

4. Express as a sum of partial fractions and *solve for the constants*:

$$\frac{3x^3 + 5x^2 + 14x + 8}{(x^2 + 4)^2} =$$

5. $\int x \sec^2 x \, dx =$ _____

6. Evaluate: $\int \ln(x^2 + 1) \, dx =$ _____ **Hint:** Don't use any kind of substitution.

7. Express as a sum of partial fractions and solve for the constants:

$$\frac{3x^2 - 4x + 1}{(x - 2)^3} = \underline{\hspace{10em}}$$

8. (a). Evaluate: $\int \frac{1}{4 + x^2} dx = \underline{\hspace{10em}}$ (Show your work!)

Hint: $\int \frac{1}{4 + x^2} dx = \frac{1}{2} \tan^{-1} \left(\frac{x}{2} \right) + C$

- (b). Express the improper integral below as a sum of two limits involving other integrals, but do not bother to evaluate the integral any further. (Just fill in the blanks.)

$$\int_1^3 \frac{1}{x - 2} dx = \lim_{t \rightarrow \underline{\hspace{1em}}} \int_{\underline{\hspace{1em}}}^{\underline{\hspace{1em}}} \frac{1}{x - 2} dx + \lim_{t \rightarrow \underline{\hspace{1em}}} \int_{\underline{\hspace{1em}}}^{\underline{\hspace{1em}}} \frac{1}{x - 2} dx.$$

9. (a). Evaluate: $\lim_{x \rightarrow 0^+} [e^{2x} + x]^{\frac{1}{x}} =$ _____

(b). Evaluate: $\int \frac{x^3 + 3x}{x^2 + 1} dx =$ _____

10. Evaluate: $\int \frac{x^2}{(4 - x^2)^{\frac{3}{2}}} dx =$ _____