Review for Math 222, Name________________,

A. (Maybe 30% of the total points).

1. Complete the following items (10 points):

1. The form of the partial fraction of $\frac{1}{x^3(x^2+x+1)^2(x-2)}$ (**no need to solve the coefficients**) is _____

2. $\int udv = uv$ _______________

3. $\frac{d}{dx} f(u(x)) = \frac{d}{du}$_______$\frac{d}{dx}$ _______________

4. If f is continuous, then $\frac{d}{dx}\int_o^x f(t)dt =$ _______________

5. $g(g^{-1}(x)) =$ _______________ and $(g^{-1}(x))' =$ _______________

6. $\frac{d}{dx}\cos^{-1} x =$ _______________

7. $\frac{d}{dx}\cot^{-1} x =$ _______________

8. $\frac{d}{dx}\sin^{-1}(g(x)) =$ _______________

9. $\frac{d}{dx}\sec^{-1} x =$ _______________

10. $\frac{d}{dx}\sec x =$ _______________

11. $\int a^x dx =$ _______________

12. $\int \sin x dx =$ _______________

13. $\int \sec x dx =$ _______________

14. $\int \csc x dx =$ _______________

15. $\int \tan x dx =$ _______________

16. $\int \sec^2 x dx =$ _______________

17. $\int x^{-1} dx =$ _______________

18. If $n \neq -1$, then $\int x^n dx =$ _______________

19. $\sinh(x) =$ _______________.

20. $\frac{d}{dx}\tanh x =$ _______________

21. $\frac{d}{dx}\sinh x =$ _______________

22. $\int_1^\infty \frac{1}{x^p} dx$ is convergent if and only if p__________

24. Under proper assumptions, $\lim_{x\to a}\frac{f(x)}{g(x)} = \lim_{x\to a}$ _____ if the limit is of $\frac{0}{0}$ type.

25. Strategy for evaluating $\int \sin^m x \cos^n x dx$, if n is odd, then use substitution $u =$ ____________ and identity $\cos^2 x =$ ____________

26. Strategy for evaluating $\int \sin^m x \cos^n x dx$, if m is odd, then use substitution $u =$ ____________ and identity $\sin^2 x =$ ____________

27 Strategy for evaluating $\int \sin^m x \cos^n x dx$, if n and m are even, then use identities
$\begin{cases} \cos^2 x = \frac{1}{2}(\quad \underline{\hspace{3cm}} \\ \sin^2 x = \frac{1}{2}(\quad \underline{\hspace{3cm}} \end{cases}$

28. Strategy for evaluating $\int \tan^m x \sec^n x dx$, if m is odd, use substitution $u =$ ________

29. Strategy for evaluating $\int \tan^m x \sec^n x dx$, if n is even, use substitution $u =$ ________

30. Table of Trigonometric Substitution in integration. Do not write down the domain.

expression	*substitution*	*identity*
$\sqrt{a^2 - x^2}$	$x =$	
$\sqrt{a^2 + x^2}$	$x =$	
$\sqrt{x^2 - a^2}$	$x =$	

31. The arc length function of curve $y = f(x)$ is $s(t) = \int_a^t$ ________

32. Area of surface of revolution if rotating about $x-$axis $S = \int_a^b$ ________

Area of surface of revolution if rotating about $y-$axis $S = \int_c^d$ ________

The following questions are related to the parametric equations of the curve C: $x = f(t)$ and $y = g(t)$, $\alpha \le t \le \beta$:

33. $\frac{dy}{dx} =$ ________ and $\frac{d^2y}{dx^2} =$ ____________________.

34. The area between the curve C and the x-axis is $A = \int_\alpha^\beta$ ____________________ dt

35. The arc length of the curve C is $L = \int_\alpha^\beta$ ____________________ dt

36. The surface area is $S = \int_\alpha^\beta$ ____________________ dt if C rotates about x-axis.

37. The surface area is $S = \int_\alpha^\beta$ ____________________ dt if C rotates about y-axis.

The following questions are related to the Polar coordinates and a polar curve C: $r = f(\theta)$, $a \le \theta \le b$.

38. $\frac{dy}{dx} =$ ____________________ (**in terms of r and θ only**).

39. The area of the polar region bounded by the curve C and the rays $\theta = a$ and $\theta = b$ is $A = \int_a^b$ ____________________ $d\theta$.

40. The arc length of the curve C is $L = \int_a^b$ ____________________ $d\theta$