

I [6] Place the answers in the blanks to the right of the question:

$$1. \int \frac{1}{\sqrt{1-x^2}} dx \quad \underline{\hspace{4cm}}$$

$$4. \int \frac{5}{1+5x} dx \quad \underline{\hspace{4cm}}$$

$$2. \frac{dy}{dx} \tanh(x) \quad \underline{\hspace{4cm}}$$

$$5. \int (\sin x \cos x) dx \quad \underline{\hspace{4cm}}$$

$$3. \int 2x \cos(x^2) dx \quad \underline{\hspace{4cm}}$$

$$6. \int e^{-2x} dx \quad \underline{\hspace{4cm}}$$

II [6] Show a step or two, even if you think you can do it within your cranium

$$7. \int \frac{\ln x}{x} dx$$

$$8. \int e^{\sinh x} \cosh(x) dx$$

$$9. \int \frac{(e^x)^2 dx}{\sqrt{1-3e^{2x}}}$$

III [16] Do four of these, clearly indicating which ones you want marked

$$10. \int \cos^3 x dx$$

$$11. \int \frac{\sin 2\theta}{(1+\cos\theta)(1-\cos\theta)} d\theta$$

$$12. \int \tanh^5 x \operatorname{sech}^2 x dx$$

$$13. \int_1^{\infty} \frac{\ln^2 x}{x} dx$$

$$14. \int \frac{\sqrt{x^2-9}}{x^3} dx$$

$$15. \int x^2 e^x dx$$

[5] Do ONE of these, clearly indicating which one you want marked

$$16. \int \frac{m-1}{m^2-m-2} dm$$

$$17. \int \frac{x-1}{x^2+2x+5} dx$$

$$18. \int \sin^2 x \cos^4 x dx$$

IV [9] Do THREE of these, clearly indicating which ones you want marked.

For the first two, it is sufficient to say whether the integral converges or not (and why).

19. $\int_1^{\infty} e^{-x} dx$

20. $\int_0^3 x^{-2} dx$

21. What goes wrong with trying to

split up :

$$\frac{1}{x^2 + 1} = \frac{A}{x + i} + \frac{B}{x - i}$$

22. $\int_0^1 6x^2 e^{4x} dx$

23. $\int \csc^3 x dx$

V [8] Do TWO of the questions in this section

24. What is the average speed of a particle that traverses the part of the curve $y = 2\sqrt{x^3}$ that is between the y-axis and $x = 6$ in a total of 2s?

25. The area bounded by $y = 2x^3$, $y = 4$, and $x = 3$ is rotated around the x-axis. Set up, but you need not evaluate, the integral for the surface area of the resulting solid.

26. The area bounded by the parabola $y - 8 = -2(x - 1)^2$ and the x-axis is rotated around the x-axis. Find the volume of the resulting solid.

27. Find the centroid of the region $y = \sin 2x$ from $x = 0$ to $x = \frac{\pi}{4}$

28. Using $n = 4$, find a trapezoidal estimate for the value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} x \cos x dx$

29. Compare the accuracy of the midpoint rule, the trapezoidal rule and Simpson's rule.

30. The Bradner city council decides to build an arch over the community entrance 50m high at the apex, anchored to the ground at points 20m apart and in the shape of a parabola. What is the length of this arch?

31. If the demand curve is $p(x) = 500 - 0.5x - .025x^2$ what is the consumer surplus at $x = 100$? Interpret this.

VI [+3, +2] Bonus (not marked unless you have 75% above)

32. $\int \frac{e^x}{e^{2x} + 4e^x + 5} dx$

33. Find the surface area of the solid in # 26 (Set up only)