Test A. P. Calculus Sections 6.1 – 6.6 Name _____

1 – 6. Multiple Choice

_____ 1. $\int \cos^2 x \sin x \, dx =$

(A) $\frac{\cos^3 x}{3} + C$

(B) $\frac{\cos^3 x \sin^2 x}{6} + C$

(C) $-\frac{\sin^2 x}{2} + C$

(D) $-\frac{\cos^3 x}{3} + C$

(E) $-\frac{\cos^3 x \sin^2 x}{6} + C$

_____ 2. $\int dv =$

(A) $v\,x + C$

(B) $v + C$

(C) $1 + C$

(D) $\frac{v^2}{2} + C$

(E) $dv + C$

_____ 3. $\int 3x\left(x^2 + 7\right)^3 dx =$

(A) $\frac{3}{4}\left(x^2 + 7\right)^4 + K$

(B) $\frac{3}{8}\left(x^2 + 7\right)^4 + K$

(C) $\frac{1}{4}\left(x^2 + 7\right)^4 + K$

(D) $3\left(x^2 + 7\right)^4 + K$

(E) None of these

_____ 4. Suppose that you approximate the area under $g(x) = \sin(x) + 2$ on the domain $\frac{\pi}{2} \le x \le \frac{3\pi}{2}$ with n = 4 subintervals, using right-hand endpoints. The width of each interval would be:

(A) $\frac{3\pi}{8}$

(B) $\frac{\pi}{8}$

(C) $\frac{\pi}{4}$

(D) $\frac{\pi}{2}$

(E) None of these

_____ 5. $\sum_{n=3}^{6}\left(\frac{n-1}{2}\right) =$

(A) $\frac{5}{2}$

(B) $\frac{7}{2}$

(C) $\frac{15}{2}$

(D) 6

(E) 7

_____ 6. Solve the differential equation $\frac{dy}{dx} = (\sin x)(5 + 5\cos x)^3$ given that $y = 0$ when $x = 0$.

(A) $y = -\frac{1}{4}(5 + 5\cos x)^4$

(B) $y = -\frac{1}{4}(5 + 5\cos x)^4 + 2,500$

(C) $y = \frac{1}{4}(5 + 5\cos x)^4 - 2,500$

(D) $y = -\frac{1}{20}(5 + 5\cos x)^4 + 500$

(E) $y = \frac{1}{20}(5 + 5\cos x)^4 - 500$

7 – 16. Free Response SHOW ALL WORK on your own paper – Do NOT write on the test paper for any problems in this section except for #16.

7. Use four rectangles of equal width to approximate the area under the curve $f(x) = 20 + x - x^2$ over the interval $0 \le x \le 4$ (use left-hand endpoints).

8. Determine the **exact** area between the curve $y = 2x$ and the x-axis over the interval $0 \le x \le 4$. Use circumscribed rectangles (right-hand endpoints in this problem) and apply a limit.

You will need to apply one of the following:

$$1 + 2 + 3 + ... + n = \frac{n(n+1)}{2}$$

$$1^2 + 2^2 + 3^2 + ... + n^2 = \frac{n(n+1)(2n+1)}{6}$$

9. Determine the area between the curve $y = x^2 - 4$ and the x-axis from $x = 0$ to $x = 4$.

10. Evaluate $\int_0^{\frac{\pi}{4}} \sec^2 x \, dx =$

11. Evaluate $\int_1^3 \left(6x^2 + \frac{6}{x^2}\right) =$

12. Evaluate $\int_0^1 \frac{x \, dx}{3x^2 + 1} =$

13. Evaluate $\int_1^5 |2x-4|\,dx =$

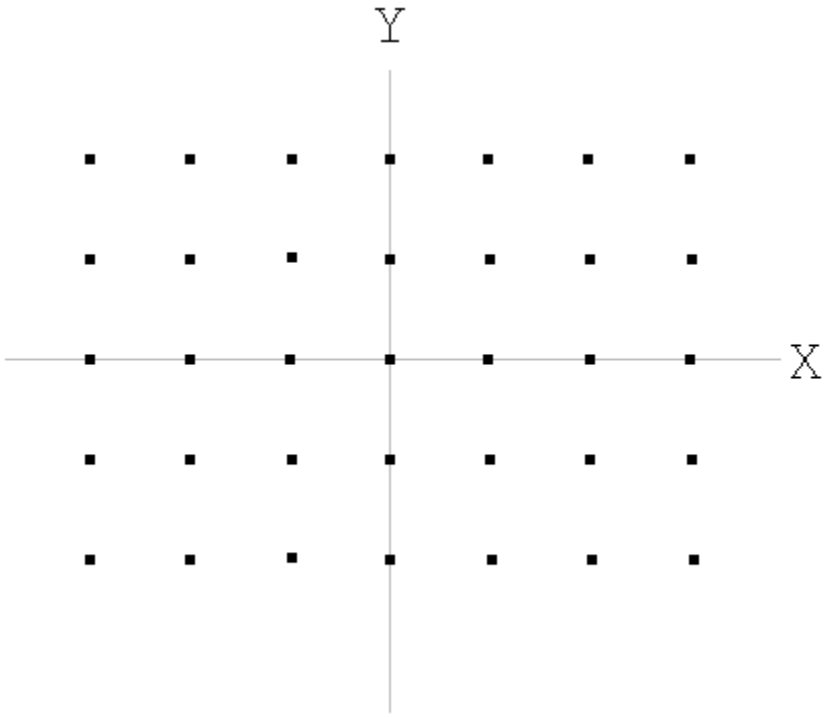
You must show ALL WORK, and you must use calculus to solve!

14. Prove by induction:

Prove: $2+4+6+...+2n = n(n+1)$

15. Solve the differential equation $\frac{dy}{dt} = -e^{2t}$, given that $y(0) = 6$

16. Draw a slope field for the differential equation $\frac{dy}{dx} = 2 - y$



Extra Credit (5 points) Evaluate $\prod_{i=2}^{4}(3i-1) =$