

Calculus BC Release Items 2015

1. The slope of the tangent line to the graph of $2x^3 + y^3 - 1 = x^2y$ at the point $(2, -3)$ is between which of the following pairs of numbers?

- a) -2, -1 b) -1, 0 c) 0, 1 d) 1, 2 e) none of these

2. If the fourth degree Taylor polynomial about $x = 1$ for $x \ln(x)$ is evaluated at $x = 2$, what is the value?

(round to the nearest hundredth)

- a) 1.39 b) 1.42 c) 1.50 d) 1.75 e) None of these

3. Let R be the region bounded by the graphs of $y = x + 2$ and $y = x^2$. Which of the following intervals contains the volume of the solid generated when R is revolved about the line $x = 5$?

- a) (20, 40) b) (40, 60) c) (60, 80) d) (80, 100) e) None of these

4. The graph of the function $f(x)$ consists of two parabolas where $f(x) = x^2 + 2x + 4$ if $-3 \leq x < -1$

and $f(x) = x^2 - 2x - 3$ if $-1 \leq x \leq 6$. If $g(x)$ is the function defined by $g(x) = \int_{-3}^x f(t) dt$, and $g(w)$

$$= \frac{10}{3}$$

Then w is between which of the following pairs of numbers. Select all that apply.

- a) -3, -2 b) -1, 0.5 c) 0.5, 2 d) 2, 3.5 e) 3.5, 6

5. Rotate the region $y = \frac{1}{x}$, $y = 0$, $x = 1$, $x = 3$ about the line $x = 4$. Find the volume created. Round to the nearest tenth.

- a) 15.0 b) 3.4 c) 12.6 d) 4.0 e) none of these

6. Given the series $\sum_{n=1}^{\infty} \frac{3n^2 + 5n}{2^n n^2 + 2^n}$, answer the following showing all work.

a. Use the Basic Comparison Test to prove either Convergence or Divergence for the series above. You may not use the Limit Comparison Test for this part.

b. Explain why the series $\sum_{n=1}^{\infty} \frac{1}{2^n}$ does not work to compare with the series above for the Basic Comparison Test but does work for the Limit Comparison Test.

Carmel High

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14. A water tank has the shape of a right circular cylinder of altitude 12 feet and radius 6 feet. If water is being pumped into the tank at a rate of 2 cubic feet per minute, approximate the rate (in feet/min) at which the water level is rising when the water is 9.325 feet deep. (nearest thousandth)

- a) 0.018 b) 0.234 c) 0.283 d) 0.325 e) none of these

15. The position of a particle moving along a line is given by $s(t) = 2t^3 - 24ct^2 + 90c^2t + 7$, $t \geq 0$, with 'c' a positive constant. For what values of t is the speed of the particle increasing? Select all that apply.

- a) $0 < t < 3c$ b) $t > 4c$ c) $t > 5c$ d) $t > 0$ e) None of these

16. If you evaluate $\int (2x)^2 e^{5x} dx$, the sum of the numerical coefficients of all terms except the constant of integration is?

- a) .9451 b) .9472 c) -24,560 d) 36,640 e) none of these

17. For what values of x is $f(x) = x^4 + x^3 + 2$ concave up? Select all that apply.

- a) -1 b) -0.667 c) -0.333 d) all real numbers e) $x > 0$

18. The coefficient of the term $a^{5/2}$ in the answer for $\int_a^{a+1} (x-1)\sqrt{x-1} dx$ is what value?

- a) 3/2 b) 1 c) 2/5 d) 0 e) None of these

19. Evaluate $\int \sec^2 x \tan x dx$. Select all that apply.

- a) $(0.5)\sec^2 x + C$ b) $(\frac{1}{6})\sec^3 x \tan^2 x + C$ c) $(0.5)\tan^2 x + C$
d) $\sec^2 x \tan x + C$ e) none of these

20. To evaluate the integral $\int \frac{\sqrt{x^2+9}}{x} dx$, a substitution may be made. Which of the following substitutions would eliminate the radical from the integrand? Select all that apply.

- a) $x = \sin(\theta)$ b) $x = 3 \sinh(\theta)$ c) $x = 3 \tan(\theta)$ d) $x = 3 \cos(\theta)$ e) $x = \tan(\theta)$

10. Given $g(x) = \arctan(\frac{1}{x})$, evaluate $\lim_{h \rightarrow 0} \frac{g(2+h) - g(2)}{h}$

- a) $\frac{4}{5}$ b) $\frac{1}{2}$ c) $-\frac{1}{5}$ d) $\frac{\ln 2}{2}$ e) none of these

11. Suppose that $f(x) = \int_{0.5}^{x^4} \frac{t}{\sqrt{t^3+2}} dt$. Then $f'(1) =$ _____.

- a) $\frac{-4}{\sqrt{3}}$ b) $\frac{1}{\sqrt{3}}$ c) $\frac{-1}{\sqrt{3}}$ d) $\frac{4}{\sqrt{3}}$ e) none of these

16. Evaluate $\int_0^1 8x^3 e^{2x} dx$

- a) $e^2 + 2$ b) $e^2 + 3$ c) $e^2 + 4$ d) $e^2 + 8$ e) none of these

21. To evaluate the integral $\int \frac{\sqrt{x^2-9}}{x} dx$, a trig substitution may be made. The differential, dx , for the best trig substitution is

- a) $3 \cos(\theta) d\theta$ b) $-3 \sin(\theta) d\theta$ c) $3 \sec^2(\theta) d\theta$ d) $3 \sec(\theta) \tan(\theta) d\theta$ e) none of these

28. Which of the following is one of the terms of a n th degree Taylor Polynomial for $f(x) = \ln(x)$ at $c = 1$?

- a) $\frac{-x^2}{2}$ b) $\frac{x^3}{3}$ c) $\frac{-(x+1)^2}{2}$ d) $\frac{(x+1)^3}{3}$ e) none of these

34. Find the interval of convergence of the series: $1 - \frac{1}{2}(x-3) + \frac{1}{3}(x-3)^2 + \dots + (-1)^n \frac{1}{n+1}(x-3)^n + \dots$

- a) All Real numbers b) (2, 4) c) (1, 3) d) $x = 3$ only e) none of these

35. Given the parametric function $\begin{cases} x = 3t^2 + 5t \\ y = 4t - 1 \end{cases}$, find $\frac{d^2y}{dx^2}$.

- a) $\frac{-24}{(6t+5)^3}$ b) $\frac{-6}{6t+5}$ c) $\frac{6t+5}{-24}$ d) 0 e) none of these