

2009 Calculus Hustle

1. Find the absolute maximum of $y = -4x^3 + 5x^2 + 8x + 3$ on the interval $[-1,2]$.
2. Find the derivative of $(\frac{x}{2})^{4x}$.
3. What is the volume of a solid above the x-axis upper bounded by $\sqrt{x+4}$ from $x=0$ to $x=5$ rotated 120° around the y axis?
4. If the edge of an square pyramid is changing at a rate of $+2$ in/sec with constant height, at what rate is the volume changing when the edge and the height both have a length of 5 feet?
5. Find the x^4 term of $f'(x)$ if $f(x) = (3x - \frac{3}{x})^8$.
6. What is the 2nd derivative of $\tan^2(x)$?
7. Given $f(x) = \sqrt[3]{x^2 + \sqrt[3]{x + \sqrt[3]{x^2 + 2}}}$, find $f'(5)$.
8. What is the maximum possible area able to be enclosed by a 60 ft. piece of rope?
9. If $y = 2x^3 - x^2 - kx - 6$ has roots $-0.5, 3$ and one other, what is the value of k ?
10. Evaluate $\int x e^x dx$
11. Evaluate $\frac{d}{dx}(e^{2x} * \ln(\cos(\ln(3x^2))))$
12. Find the decreasing intervals for $y = -4x^3 + 2x^2 + x + 3$
13. $\lim_{x \rightarrow \infty} \frac{3x^4 - 62x^3}{e^{x^2}}$
14. Find the equation of the linear approximation of $y = \sqrt{3x^2 - 2x - 4}$ from the point $(4, 6)$.
15. What are the first 3 terms of the Maclaurin expansion of $\sin(x)$?
16. Evaluate $\int \tan 2x dx$
17. Evaluate: $\lim_{x \rightarrow \frac{3}{7}} \frac{343x^3 - 27}{7x^2 + 4x - 3}$
18. Evaluate $\sum_{i=1}^{2009} \int_0^i 2x dx$
19. Find $F^{(2009)}(-\sin x)$
20. Implicitly differentiate: $x^2y - y^2 = 4 + xy - x$ and give $\frac{dy}{dx}$

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21. What is the sum of x 's that satisfy the MVT for $y = x^3 - 2x^2 + 3x + 4$ on the interval $[-1,2]$?

22. Evaluate $\int \frac{e^{3x}}{4} - \cos 2x \, dx$

23. $(t) = e^{t^2} - 4t^2$

$y(t) = \cos(t)^3 + \ln(4^t)$ Find $\frac{d^2y}{dx^2}$.

24. What is the radius of convergence for $\sum_{i=1}^n \frac{(x-5)^{2n}}{3n}$

25. $\lim_{x \rightarrow \infty} \left(\frac{5x+3}{5x}\right)^{5x} = L$. What is L ?