Calculus AB Individual

Haynes Mu Alpha Theta 2019

Instructions

1. You have 50 minutes for this test.
2. No calculators allowed on this test.
3. Do all scratch work on your test.
4. Units are not required unless problem specifically says [units required]
5. Provide exact answers unless otherwise stated.
6. Put name and school code on answer sheet.
7. Good luck and have fun!

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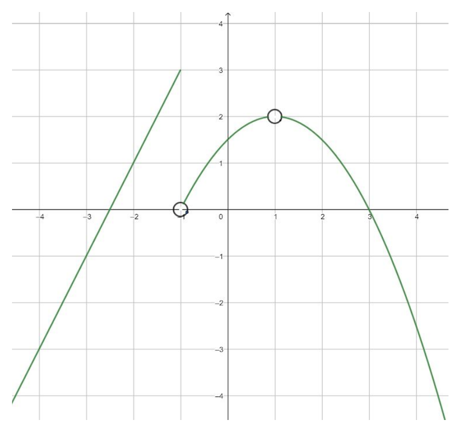
1) Find $\lim_{x\to\infty} \frac{\sqrt{3x^4+10x^3+4x-2}}{5x^2+9x+3}$

2) Find the equation of the tangent line to the function $9 = 2x + y^2x + yx^2$ at (1, 1) in slope-intercept form.

3) Taylor Tarleton has a puny brain and does not know how to find the derivative of $e^{ln(2e^x)}$ Help him out.

4) Find the x-coordinate of the point of inflection of $f(x)$ if $f'(x) = x^2 + 3x + 4$.

5) Find the 74th derivative of $-74cos(74x)$ (Note: do NOT simplify exponents).



6) Using the graph of the function f on the right, find $\lim_{x\to -1^-} f(f(x))$

7) If $\int_0^x f(t)\,dt = e^{2x}cos(x) + C$, find the value of the constant C AND the function $f(t)$.

8) If $F(x) = \int_0^{2x} cos(\frac{\pi}{3}t)\,dt$, find $F'(2)$.

9) The circumference of a circle is increasing at the rate of 5 meters/min. What is the rate of change of the area of the circle when the radius is 4 meters? [units required]

10) On what interval(s) is the function $f(x) = 2x^3 + 4x^2 - 1$ decreasing and concave down?

11) Find the average value of the function $f(x) = x^3 e^{x^4}$ on the interval [0, 3].

12) Scoobert-Doo is running away from the Creeper, who is 8 feet tall. If the Creeper started at a pole and limped away from it at a speed of 8 ft/s, what is the rate at which his shadow is increasing? Assume there is a light on the pole 20 feet above the ground. [units required]

13) Jeffery may have had one too many liters of "punch" on Halloween. Because of his intoxication, he began to hand out money from under his mattress rather than candy to trick-or-treaters. After $ln\ 5$ minutes, Jeffery's life savings dropped from \$200,000 to \$8,000, at an exponential decline. If the exponential decline continues, how much moolah will Jeffery have left after $ln\ 50$ minutes?

14) Many people say that Amie Sigur is a complete square. However, she can evaluate

$\int \frac{dx}{x^2+2x+2}$. Can you? If so, give the answer.

15) Evaluate $\int_{-\pi/2}^{\pi/2} sin^6(x)cos(x)\,dx$.

16) Find $\lim_{x\to 1} \frac{x^3+ln(x)-1}{4x^2-x-3}$

17) Find the equation of the line tangent to the graph of $x^2+(y-x)^3=9$ at $x=1$ in slope-intercept form.

18) At Chili's, baby back ribs are delicious. What is the volume of the "rib of revolution" formed when the region bounded by the functions $y=\sqrt{x}$ and $y=x^2$ is rotated around the line $y=-1$?

19) Evaluate the definite integral $\int_0^{0.5} \frac{x^2}{(1-x^2)^{3/2}}\,dx$ (Hint: let $x=sin\,u$)

20) Find $g'(3)$ if $g(x)=x(2^{h(x)})$, where $h(3)=-2$ and $h'(3)=5$.

Answer Key

1. $\sqrt{3}/5$
2. $y = -\frac{5}{3}x + \frac{8}{3}$
3. $2e^x$
4. $-3/2$
5. $74^{75}cos(74x)$
6. 0
7. $C = -1$; $f(t) = 2e^{2t}cos(t) - e^{2t}sin(t)$ (accept if function is in terms of x instead of t)
8. -1
9. 20 m^2/min [units required]
10. $(-4/3, -2/3)$ or $-4/3 < x < -2/3$ (accept brackets or parentheses)
11. $\frac{1}{12}(e^{81} - 1)$
12. 16/3 ft/s [units required]
13. $80
14. $tan^{-1}(x+1) + C$
15. 2/7
16. 4/7
17. $y = \frac{5}{6}x + \frac{13}{6}$
18. $29\pi/30$
19. $\frac{1}{6}(2\sqrt{3} - \pi)$
20. $\frac{1}{4}(1 + 15ln2)$