

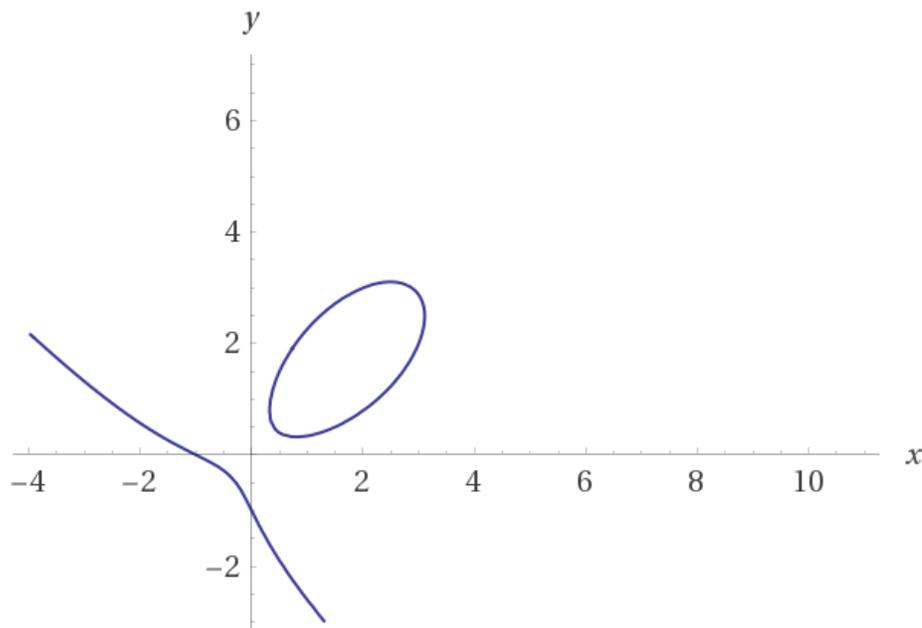
Math 131 - Test 3
November 18, 2020

Name _____

Score _____

Show all work to receive full credit. Supply explanations where necessary. This test is due November 30 by email. **You must work individually on this test.**

1. (10 points) The graph of the equation $x^3 + y^3 = 6xy - 1$ is shown below. Find an equation of the normal line at the point $(2, 3)$.



Computed by Wolfram|Alpha

2. (5 points) Let $f(x) = x^5 + 2x^3 + x$. Find $(f^{-1})'(-4)$.

3. (6 points) Find the slope of the line tangent to the graph of $y = (\cos^{-1} x)^2$ at the point where $x = 1/\sqrt{2}$.

4. (8 points) Use logarithmic differentiation to find dy/dx : $y = \frac{\sqrt{(2x+1)(3x+2)}}{(4x+3)^2}$

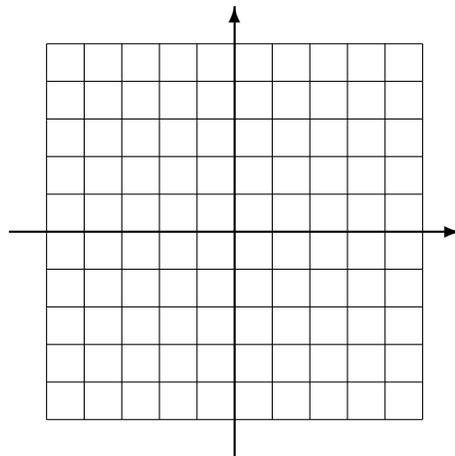
5. (4 points) Find $g'(x)$ if $g(x) = 2^{\cot x}$.

6. (7 points) Find the linearization of $h(x) = \sqrt[3]{x} + \sqrt[5]{x} + \sqrt[7]{x}$ at $x = 1$. Then use your linearization to approximate $h(1.1)$.

7. (7 points) Find all critical numbers of $f(x) = 5x^{3/7} - 2x^{10/7}$.
(Helpful hint: Simplify your derivative by factoring out $x^{-4/7}$.)

8. (8 points) Use calculus techniques to find the absolute extreme values of $f(x) = 1 - 2 \sin x$ on the interval $[-1, 2]$.

9. (6 points) Let $f(x) = 2 - (x - 1)^2$ on $[0, 3]$. Carefully sketch the graph of f on $[0, 3]$. Then find a point at which the instantaneous rate of change of f is equal to the average rate of change of f . (Helpful hint: Refer to the Mean Value Theorem.)



10. (6 points) Let $g(x) = x^4 + \cos(20x)$. Without looking at the graph of g , determine whether the graph is concave up or concave down at the point where $x = 0.7$.

11. (10 points) Find open intervals on which the graph of $f(x) = 2x^4 - 16x^2 + 3$ is increasing/decreasing. Also identify all relative extreme values.
12. (12 points) Let $f(x) = (x - 6)^3(x - 2)$. Find $f''(x)$ and write it in factored form. Then find open intervals on which the graph of f is concave up/down. Identify all points of inflection of the graph of f .

13. (5 points) Evaluate the limit: $\lim_{x \rightarrow -\infty} \frac{7x - 13}{\sqrt{4x^2 - 3x - 8}}$

14. (4 points) Find all horizontal and vertical asymptotes of the graph of $H(x) = \frac{3x^2 + 7x}{(x - 3)(2x + 1)}$.

15. (2 points) Evaluate the limit: $\lim_{x \rightarrow \infty} \frac{\cos x}{x}$