Instructions:

- Write your name and EID on **every page**.
- Put your answers on the last sheet of paper.
- No other outside resources, such as books, notes, the internet, or other people, are allowed.
- There are 110 possible points. The max possible score is 105. It will be graded out of 100.

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1. (7 points) If $f(x) = x^2 + 2x + e^{2x}$, find $f'(0)$

   (A) 1 (B) 2 (C) 3 (D) 4 (E) 5 (F) 6

2. (7 points) Find the x-intercept of the line tangent to $f(x) = 2\sin(2x) + 3\cos(x)$ at the point $(0, f(0))$.

   (A) 0 (B) $-\frac{1}{4}$ (C) $-\frac{1}{3}$ (D) $-\frac{1}{2}$ (E) $-\frac{2}{3}$ (F) $-\frac{3}{4}$

3. (7 points) Let $f(x) = \dfrac{\sinh(4x)}{\cosh(3x) + 2}$. Find $f'(0)$

   (A) 0 (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) $\frac{2}{3}$ (E) 1 (F) $\frac{4}{3}$

4. (7 points) If $f(x) = x^2\sin(x) + 2x\cos(x)$, then $f'(x) =$

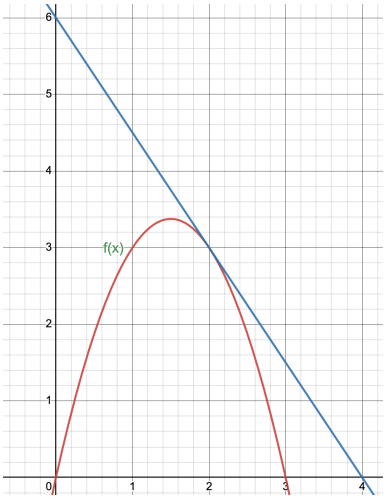
   (A) $(x^2 - 2)\cos(x)$ (B) $(x^2 + 2)\cos(x)$ (C) $(x^2 - 2)\sin(x)$ (D) $(x^2 + 2)\sin(x)$ (E) None of These

5. (7 points) Let $h(x) = f(f(x)) \cdot g(x)$. Use the table of values below to find $h'(1)$.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	4	2	-1	4
2	3	3	3	5
3	2	4	-2	-1
4	-1	2	3	4

(A) 0 (B) -6 (C) -8 (D) 4 (E) 1 (F) None of These

6. (7 points) The graph $f(x)$ and the tangent line at $x = 2$ are shown below. Let $g(x) = \ln(f(x))$. Find $g'(2)$



(A) $\frac{1}{3}$ (B) $\frac{2}{3}$ (C) $-\frac{2}{3}$ (D) $-\frac{1}{2}$ (E) $\frac{2}{9}$ (F) $-\frac{1}{9}$

7. (7 points) The function $f(x) = 3x + 2\sin(3x) + 2e^{3x}$ is 1-1, Find $(f^{-1})'(2)$.

(A) $\frac{1}{15}$ (B) $\frac{1}{13}$ (C) $\frac{1}{12}$ (D) $\frac{1}{9}$ (E) $\frac{1}{6}$ (F) $\frac{1}{5}$

8. (7 points) A ferris wheel with radius 10m is tangent to the ground. The wheel makes one full rotation every two minutes. How fast, in m/min, is a person moving vertically when they are 19m above the ground?

   (A) $\sqrt{19}\,\pi$ (B) 4π (C) 8π (D) $\sqrt{15}\,\pi$ (E) $\sqrt{11}\,\pi$ (F) $2\,\pi$

9. (7 points) Use linearization to estimate the value of $\sqrt{0.9}$.

   (A) $\frac{9}{10}$ (B) $\frac{11}{12}$ (C) $\frac{15}{16}$ (D) $\frac{19}{20}$ (E) $\frac{37}{40}$ (F) $\frac{80}{83}$

10. (7 points) The critical numbers(s) of $f(x) = x^{1/3}(4-x)^{2/3}$ are $x = 0, 4$, and:

    (A) $\frac{4}{5}$ (B) 1 (C) $\frac{3}{2}$ (D)$\frac{7}{4}$ (E) $\frac{4}{3}$ (F) 2

11. (7 points) Find the absolute minimum value of $f(x) = \cos^2(x) - \cos(x)$ on the interval $[0, \pi/2]$

    (A) 0 (B) $-\frac{1}{12}$ (C) $-\frac{1}{8}$ (D) $-\frac{1}{6}$ (E) $-\frac{1}{4}$ (F) $-\frac{1}{3}$

12. (4 points): True or False: If $f(x) = |x^2 - 5|$. them $f'(2) = -4$.

13. (4 points): True or False: The function $f(x) = x^2 - 2x + 1$ on $[0, 2]$ satisfies the Mean Value Theorem.

14. (4 points): True or False: The function $f(x) = 1 - x^{2/3}$ on $[-1, 1]$ satisfies Rolle's Theorem.

15. (9 points) Free Response: Find all the critical numbers of $f(x) = \dfrac{x^2 + 6}{2x + 1}$. Put a box around your final answer.

16. (12 points) Free Response: There is one line tangent to $2xy + y^2 = 7$ that passes through the point $(7, 0)$. Find the **slope** of this tangent line. Put a box around your final answer.

Multiple Choice (7 points each):

1) **7)**

2) **8)**

3) **9)**

4) **10)**

5) **11)**

6)

True or False (4 points each):

12) **14)**

13)