

Name _____ Rec. Instr. _____
Signature _____ Rec. Time _____

Math 220
Exam 2
March 2, 2023

No books, calculators, or notes are allowed. Please make sure that your cell phone is turned off. You will have 75 minutes to complete the exam. Unless instructed otherwise, show your work on each problem.

| Problem | Points | Points Possible | Problem | Points | Points Possible |
|---------|--------|-----------------|--------------------|--------|-----------------|
| 1 | | 30 | 6 | | 5 |
| 2 | | 10 | 7 | | 10 |
| 3 | | 9 | 8 | | 9 |
| 4 | | 9 | 9 | | 9 |
| 5 | | 9 | Total Score | | 100 |

1. (6 points each) Find the following derivatives. You **do not need to simplify** your answers or show your work. However, showing your work may help you earn partial credit if your answer is incorrect.

A. $\frac{d}{dx} \left(\frac{6}{x^2} + 6^x + e^2 \right)$

B. $\frac{d}{dx} \left(x^{5/2} \cdot \ln(x) \right)$

C. $\frac{d}{dt} \arctan(t^3 - 5t)$

D. $\frac{d}{d\theta} \sqrt{\cos(5\theta)}$

E. $\frac{d}{dx} \left(\frac{\tan(x) - x}{e^x + x} \right)$

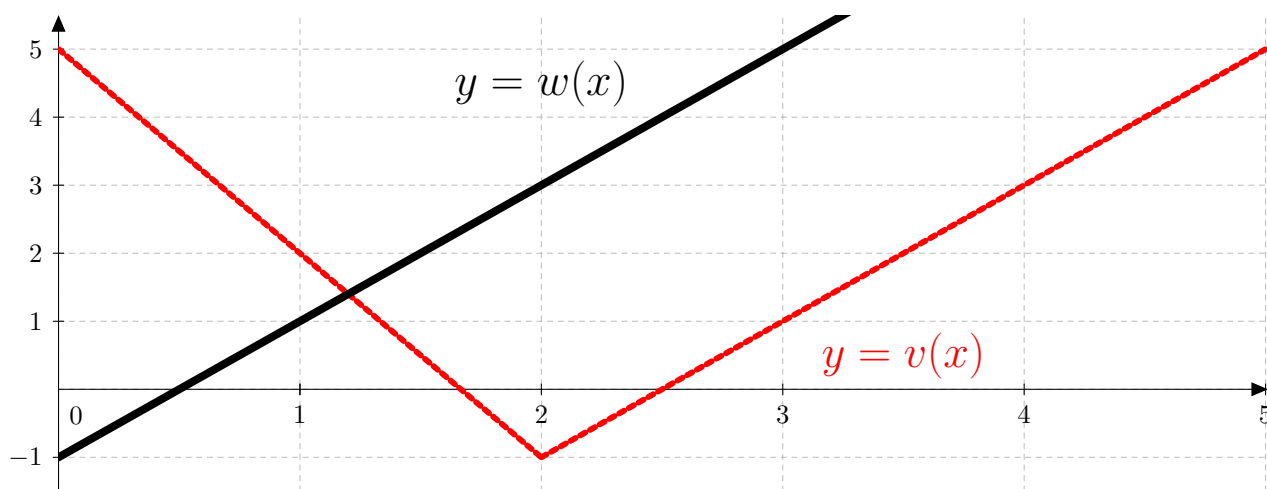
2. (10 points) Find the equation of the tangent line to the curve $y = \sin(x) + 2$ at $x = 0$.

3. (9 points) Let $g(x) = 7x^2 + x$. Using the **limit definition of the derivative**, find $g'(x)$. Make sure to use limit notation correctly.

4. (9 points) Find $\frac{dy}{dx}$ if $x^4 + xy + 2y^3 = 7$.

5. (9 points) Find $\frac{dy}{dx}$ if $\sin(xy) = x^2$.

6. (5 points) The height of a plane in meters at time t seconds after the plane elevates off of the ground at takeoff is given by $h(t)$. Is $h'(1)$ positive or negative? Briefly explain your answer.



7. (5 points each) $y = v(x)$ and $y = w(x)$ are graphed above. Suppose that $p(x) = v(x) \cdot w(x)$ and $q(x) = v(w(x))$. Find:

A. $p'(1)$

B. $q'(2)$

8. (9 points) Find the derivative of $f(x) = x^{\cos(x)}$.

9. The height in feet of a ball t seconds after being thrown directly upward is given by $y(t) = -16t^2 + 40t + 5$.

A. (6 points) Find the velocity 1 second after the ball is thrown (**include units with your answer**).

B. (3 points) Is the ball going upward or downward 1 second after being thrown?