

HONOR STATEMENT

I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam.

Name

Signature

Student ID #

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10	10	10	10	10	10	10	10	80

- You have 80 minutes for 8 problems. Check your copy of the exam for completeness.
- You are allowed to use a hand written sheet of paper (8x11 in), back and front.
- Calculator : TI 30 X.
- Justify all your answers and show your work for credit.
- Some credit is given for adhering to formal aspects such as keeping the limit symbol until you take the limit, setting correct parentheses etc.
- All answers must be exact, no rounding.

Do not open the test until everyone has a copy and the start of the test is announced.

GOOD LUCK!

Problem 1. Find the limit of the following expression. Your answer must be a real number (exact value), ∞ , $-\infty$, or DNE, whatever fits best. Justify all your work algebraically.

$$\lim_{x \rightarrow 2^+} \left(\frac{\sqrt{x^2 - 4}}{x - 2} \right).$$

Problem 2. Find the limit of the following expression. Your answer must be a real number (exact value), ∞ , $-\infty$, or DNE, whatever fits **best**. Justify all your work algebraically.

$$\lim_{x \rightarrow 0} \left(\frac{1}{x\sqrt{x+1}} - \frac{1}{x} \right).$$

Problem 3. Find the derivative of $f(x) = \cos(x) \sin(x) + 3e^x$

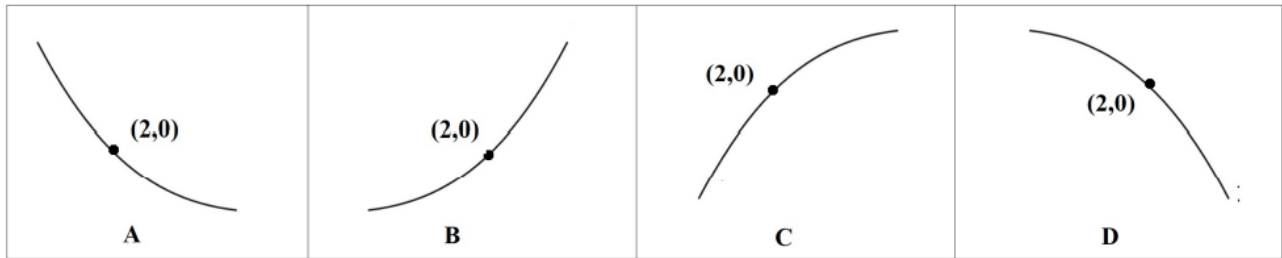
Problem 4. Find the tangent line equation to the graph of

$$f(x) = \frac{x+1}{\sqrt{x}+2} \text{ at } x = 1.$$

Do not round.

Problem 5.

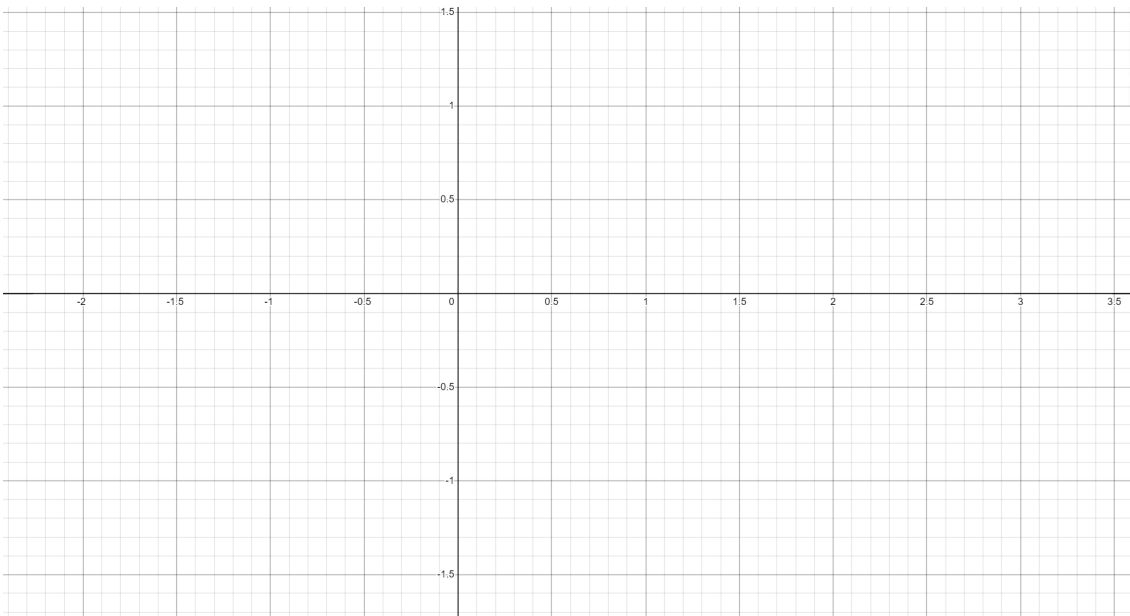
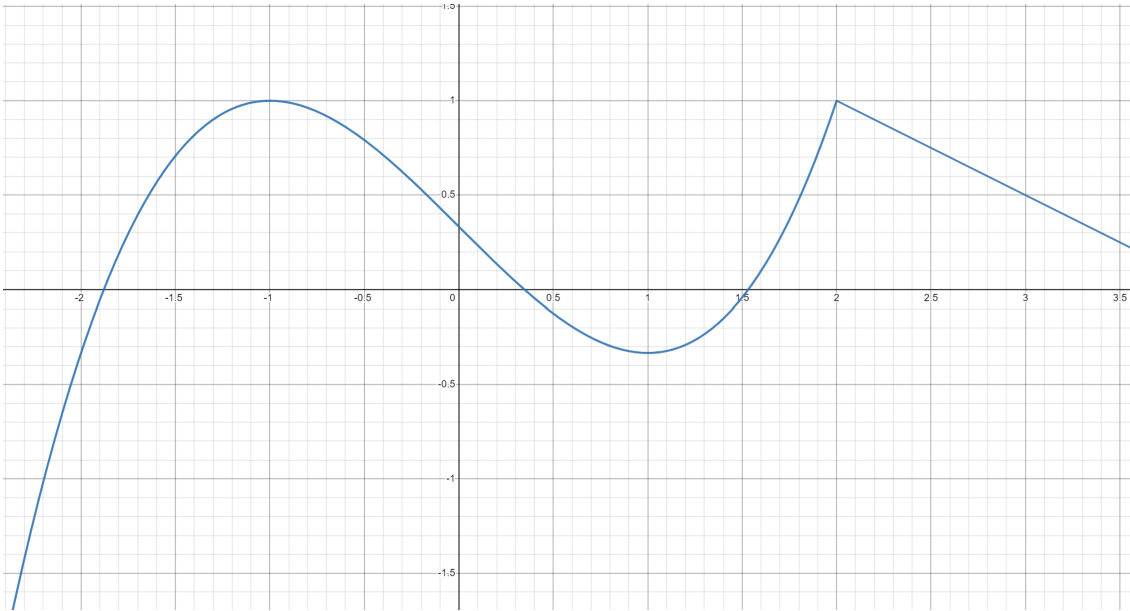
Assume that f is a function so that $f(2) = 0$, $f'(2) = -1$, and $f''(2) = 2$. For **each** of the following options argue why it can **or** why it can not be the graph of f locally around $x = 2$.



Problem 6. Consider the function $f(x) = x^2 - 4x + 1$. There are two tangent lines to the graph of $f(x)$ that have x -intercept 4. Find both points of tangency.

Problem 7. Consider the following graph of the function $f(x)$. In the given blank coordinate system sketch the graph of $f'(x)$. Be sure to correctly sketch

- Where $f'(x)$ is positive/negative or equal to 0.
- Where $f'(x)$ is constant and what value that constant is.
- Where $f'(x)$ is increasing and where it is decreasing.
- Where $f'(x)$ is not defined.



Problem 8. The temperature of a probe in a laboratory is described by the function

$$T(x) = \frac{2x^2 + 1}{x^2 + 3},$$

where T is the temperature in Celsius and x is time in minutes. We only consider times $x \geq 0$.

- (a) Why is it true that the temperature always increases?
- (b) Which temperature is the probe getting closer and closer to after sitting in the laboratory for a very long time?

