

Another Sample Midterm 2

1. (1 point) write your name, section number, and GSI's name on your exam and write your name on your sheet of notes.

2. (3 points) Suppose f is twice differentiable on the interval $[0, 4]$ and satisfies

$$\begin{array}{cccccc} f'(0) = 1 & f'(1) = 0 & f'(2) = 0 & f'(3) = -1 & f'(4) = 0 \\ f''(0) = -1 & f''(1) = -2 & f''(2) = 0 & f''(3) = 1 & f''(4) = 1 \end{array}$$

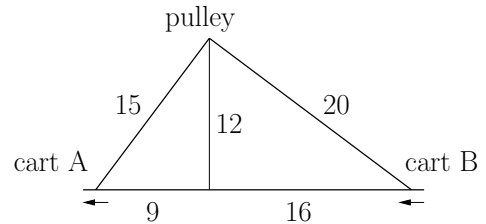
At the endpoints $x = 0$ and $x = 4$, these are one-sided derivatives. Fill in the following table with YES, NO, or CBT (cannot be determined).

$c =$	0	1	2	3	4
f has a local max at c					
f has a local min at c					

3. (5 points) Let $f(x) = x^x$. Compute $f'(2)$, $f'(4)$ and $(f \circ f)'(2)$. Note that $4^4 = 256$.

4. (5 points) Use a linear approximation to estimate: $\frac{1}{\pi} \tan^{-1} \left(1 + \frac{\pi}{100} \right)$.

5. (6 points) Two carts are connected by a 35 foot rope that passes over a pulley 12 feet above the floor. Cart A is being pulled to the left at a speed of 2 ft/sec. How fast is cart B moving at the instant cart A is 9 feet from the point on the floor beneath the pulley?



6. (5 points) Show that there is exactly one $x \in \mathbb{R}$ satisfying

$$x^5 + e^x - 2 = 0.$$

7. (5 points) Do *one* of the following:

(a) Show that

$$\tanh(\sinh^{-1} x) = \frac{x}{\sqrt{1+x^2}} \quad (x \in \mathbb{R}).$$

(b) If $g(x) = 1 + x + e^x$, find $g^{-1}(2)$ and $(g^{-1})'(2)$.