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1. This problem concerns the function $f(x) = \ln|x|$.
- (a) (2 pts.) Does the mean value theorem hold for f on the interval $[-1, 1]$? Why or why not?
- (b) (2 pts.) Does the mean value theorem hold for f on the interval $[1, e]$? Why or why not?
- (c) (2 pts.) Does the mean value theorem hold for f on the interval $[0, 1]$? Why or why not?
- (d) (4 pts.) If the mean value theorem holds for one of the above intervals, find all numbers $x = c$ in the interval that are guaranteed by the theorem.
2. In this problem $f(x)$ is a function for which $f(10) = -7$ and $f'(10) = 2$.
- (a) (6 pts.) Find the linear approximation for $f(x)$ at 10.
Put your answer in the form $L(x) = mx + b$.
- (b) (4 pts.) Use your answer from part (a) to find the approximate value of $f(11)$.

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1. This problem concerns the function $f(x) = \frac{1}{x}$.
- (a) (2 pts.) Does the mean value theorem hold for f on the interval $[-1, 1]$? Why or why not?
- (b) (2 pts.) Does the mean value theorem hold for f on the interval $[0, 1]$? Why or why not?
- (c) (2 pts.) Does the mean value theorem hold for f on the interval $[1, 2]$? Why or why not?
- (d) (4 pts.) If the mean value theorem holds for one of the above intervals, find all numbers $x = c$ in the interval that are guaranteed by the theorem.
2. In this problem $f(x)$ is a function for which $f(5) = 4$ and $f'(5) = -2$.
- (a) (6 pts.) Find the linear approximation for $f(x)$ at 5.
Put your answer in the form $L(x) = mx + b$.
- (b) (4 pts.) Use your answer from part (a) to find the approximate value of $f(5.5)$.

1. This problem concerns the function $f(x) = \frac{1}{x-1}$.

(a) (3 pts.) Does the mean value theorem hold for f on the interval $[0, 3]$? Why or why not?

(b) (3 pts.) Does the mean value theorem hold for f on the interval $[2, 3]$? Why or why not?

(c) (4 pts.) If the mean value theorem holds for one of the above intervals, find all numbers $x = c$ in the interval that are guaranteed by the theorem.

2. In this problem $f(x)$ is a function for which $f(15) = 2$ and $f'(15) = -3$.

(a) (6 pts.) Find the linear approximation for $f(x)$ at 15.

Put your answer in the form $L(x) = mx + b$.

(b) (4 pts.) Use your answer from part (a) to find the approximate value of $f(16)$.

