Principles of Calculus Modeling: An Interactive Approach by Donald Kreider, Dwight Lahr, and Susan Diesel
Exercises for Section 2.5

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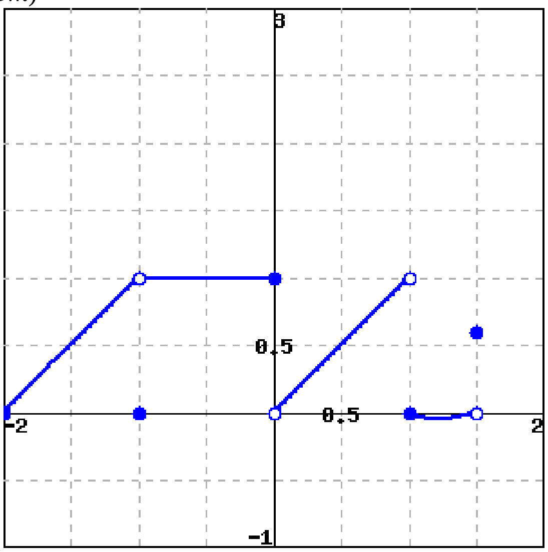
1. (1 pt)
If the graph of f is as shown below, then at what points does f have a removable discontinuity? (**Click the image for a larger view.**)



Enter removable discontinuities from left to right. Use only those answer boxes that you need; leave the rest blank.
first discontinuity:
$x =$ ______________

second discontinuity:
$x =$ ______________

third discontinuity:
$x =$ ______________

fourth discontinuity:
$x =$ ______________

Redefine f at each of the removable discontinuities so as to make it continuous there. Again, use only those answer boxes that you need.

At the first discontinuity,
define $f(x) =$ ______________

At the second discontinuity,
define $f(x) =$ ______________

At the third discontinuity,
define $f(x) =$ ______________

At the fourth discontinuity,
define $f(x) =$ ______________

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2. (1 pt)
Consider the function
$$f(x) = \begin{cases} 4x & \text{if } x < 0 \\ x^4 & \text{if } x \geq 0 \end{cases}$$
Choose the answer which best describes the continuity of this function.

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A. The function has a removable discontinuity at 0, but is continuous on the rest of the real line.
B. The function is continuous on the real line.
C. The function is a composition of two continuous functions, and is therefore continuous on the real line.
D. The function is unbounded and therefore cannot be continuous.
E. The function has a continuous extension to $x = 0$.

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3. (1 pt)
Consider the function
$$f(x) = \begin{cases} x^3 & \text{if } x \leq 1 \\ 0.569 & \text{if } x > 1 \end{cases}$$
Choose the answer which best describes the continuity of this function.

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A. The function is a composition of two continuous functions, and is therefore continuous on the real line.
B. The function is discontinuous at $x = 1$, but continuous on the rest of the real line.
C. The function is unbounded and therefore cannot be continuous.
D. The function has a removable discontinuity at 1, but is continuous on the rest of the real line.
E. The function has a continuous extension to $x = 1$.

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4. (1 pt)
Consider the function $f(x) = \dfrac{x^2 - 2}{x^4 - 6x^2 + 8}$. How should $f(x)$ be defined at $x = \sqrt{2}$ to be continuous there? Give a formula for the continuous extension of f that includes $\pm\sqrt{2}$ in its domain.
$F(x) =$ ______________

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5. (1 pt)
Consider the function
$$g(x) = \begin{cases} x - m & \text{if } x < 2 \\ 1 - mx & \text{if } x \geq 2 \end{cases}$$
Find m so that $g(x)$ is continuous on the real line.
$m =$ ______________

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6. (1 pt)
If $f(x) = x^5 + 4x - 1$, does f have a zero between $x = 0$ and $x = 1$?

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A. no
B. yes

What theorem tells you that this is the case?

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A. Mean-Value Theorem
B. Two-Sided Limit Theorem

C. Squeeze Theorem
D. Max-Min Theorem
E. Intermediate-Value Theorem

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7. (1 pt)
If $f(x) = \dfrac{3x-30}{x^2-7x-30}$, then at what points does f have a discontinuity? Enter discontinuities from smallest to greatest. Use only those answer boxes that you need; leave the rest blank.

first discontinuity:
$x =$ ____________________
second discontinuity:
$x =$ ____________________
third discontinuity:
$x =$ ____________________
fourth discontinuity:
$x =$ ____________________

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8. (1 pt)
If $f(x) = \dfrac{10x}{|x^2-8x|}$, then at what points does f have a discontinuity? Enter discontinuities from smallest to greatest. Use only those answer boxes that you need; leave the rest blank.

first discontinuity:
$x =$ ____________________
second discontinuity:
$x =$ ____________________
third discontinuity:
$x =$ ____________________
fourth discontinuity:
$x =$ ____________________

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9. (1 pt)
Consider the function

$$f(x) = \begin{cases} 2x^2-4 & \text{if } x<0 \\ x-4 & \text{if } x \geq 0 \end{cases}$$

Is f right continuous? (**Y** or **N**)
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Is f left continuous? (**Y** or **N**)
___
Is f continuous? (**Y** or **N**)
___

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10. (1 pt)
On which of the following intervals is $f(x) = \dfrac{1}{\sqrt{x-8}}$ continuous?

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A. $[8,+\infty)$
B. $(8,+\infty)$
C. $[1,8)$
D. $(-\infty,+\infty)$

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11. (1 pt)
Consider the following function:

$$f(x) = \begin{cases} cx+2.1 & \text{if } x \leq 6 \\ cx^2-2.1 & \text{if } x > 6 \end{cases}$$

Which of the following is true?

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A. f is continuous
B. f is discontinuous everywhere
C. f has one removable discontinuity
D. f has infinitely many discontinuities

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12. (1 pt)
Let

$$f(x) = \begin{cases} cx+2 & \text{if } x \leq 5 \\ cx^2-2 & \text{if } x > 5 \end{cases}$$

For what value of c is the fucntion f continuous on $(-\infty,\infty)$?
c = ____________________

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13. (1 pt)
If $f(x) = \dfrac{7x+11}{x^3-23x^2+151x-273}$, then at what points does f have a discontinuity? Enter discontinuities from smallest to greatest. Use only those answer boxes that you need; leave the rest blank.

first discontinuity:
$x =$ _______________
second discontinuity:
$x =$ _______________
third discontinuity:
$x =$ _______________
fourth discontinuity:
$x =$ _______________