Limits and continuity Worksheet

AP and College Calculus

Name _____ Date _____

Warm-up

1. $\lim_{x\to 2} x^2$

2. $\lim_{x\to\infty} \dfrac{7x+1}{5x+2}$

3. Where is $\dfrac{1}{x-9}$ not continuous?
   (A) $x = 9$ (B) $x = 0$ (C) Nowhere (D) Everywhere

4. $\lim_{x\to -4}(3x+3)$

5. $\lim_{x\to\infty} \dfrac{19}{x}$

Practice

6. $\lim_{x\to 4} \dfrac{x^2-x-12}{x-4}$

7. $\lim_{x\to\infty} \dfrac{x^3}{2x^2+1}$
   (A) ∞ (B) 0 (C) $\dfrac{1}{2}$ (D) 2

8. $f(x) = x+2$ for $x < 2$, and kx for $x \geq 2$. Find k for continuity.

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9. The left limit at $x = 6$ is 5, and the right limit is 5. The value $f(6)$ is 2. What's the limit?
   (A) Does not exist (B) 2 (C) 7 (D) 5

10. $\lim_{x\to\infty} \dfrac{5x+1}{x^2+1}$

11. Left limit 2, right limit 5. The type of break is...
   (A) Hole (B) No break (C) Jump (D) Asymptote

12. The left limit at $x = 8$ is 5, and the right limit is 6. What's the limit?
   (A) Does not exist (B) 6 (C) 11 (D) 5

13. $\lim_{x\to\infty} \dfrac{7x^2+4x}{6x^2-1}$

Challenge

14. $\lim_{x\to 16} \dfrac{\sqrt{x}-4}{x-16}$

15. A drug's amount is $A(t) = \dfrac{72t}{t+4}$. What value does it approach over time?

16. $f(x) = 2x + 1$ for $x < 1$, and $x^2 + k$ for $x \geq 1$. Find k for continuity.

17. $\lim_{x\to 2} \dfrac{x^3-8}{x-2}$

18. Find the horizontal asymptote of $y = \dfrac{9x^2+1}{8x^2-3}$. Give y.

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Limits and continuity Worksheet: Answer Key

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1. 4

   Substitute.

2. $\frac{7}{5}$

   Same power: ratio of leading numbers.

3. (A) $x = 9$

   The denominator is zero there.

4. -9

   Substitute.

5. 0

   A fixed top over a growing bottom shrinks to 0.

6. 7

   Factor: $(x - 4)(x + 3)$.

7. (A) ∞

   Top's power is bigger.

8. 2

   Left limit is $2 + 2$. Set equal to $2k$.

9. (D) 5

   A limit only cares about nearby values.

10. 0

    Bottom's power is bigger.

11. (C) Jump

    The two sides disagree.

12. (A) Does not exist

    The sides must agree.

13. $\frac{7}{6}$

    Same highest power.

14. $\frac{1}{8}$

    $x - 16 = (\sqrt{x} - 4)(\sqrt{x} + 4)$.

15. 72

    Same power: $\frac{72}{1}$.

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16. 2

    $2 + 1 = 1 + k$.

17. 12

    $x^3 - 2^3 = (x - 2)(x^2 + 2x + 4)$.

18. $y = \dfrac{9}{8}$

    It's the limit at infinity.

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