Limits At Infinity

Evaluate each of the following limits.

1. $\lim\limits_{t\to-\infty}\dfrac{10-t-5t^3}{6t^2-7t}$

2. $\lim\limits_{x\to\infty}\dfrac{5x^3+1}{(2x+3)(1-x^2)}$

3. $\lim\limits_{z\to\infty}\dfrac{1-z}{1+z+z^2}$

4. Evaluate $\lim\limits_{w\to\infty}\dfrac{\sqrt{1+5w^2}}{3-w}$ and $\lim\limits_{w\to-\infty}\dfrac{\sqrt{1+5w^2}}{3-w}$.

Continuity

5. Determine where the following function is NOT continuous.

$$g(x)=\frac{3x+7}{x\cos(2x)+x}$$

6. Use the Intermediate Value Theorem to show that somewhere in the interval [5, 8] there is a root of $f(x)=x\cos(x)+\mathbf{e}^x\sin(x)$. Note that you aren't being asked to actually find the root, only show that one exists.

7. The function

$$A(t)=\left(t^2-1\right)\mathbf{e}^{1-t^2}$$

will have the value of -1 somewhere in the interval [-2, 2]. Use the Intermediate Value theorem to find a span of width of no more that ½ in which the function will have a value of -1. Note that there are multiple answers to this question and any of them will be accepted.

Definition of the Derivative

For problems 8 – 11 use the definition of the derivative to compute the derivative of the given function.

8. $g(x)=4+11x$

9. $f(x)=1+8x-2x^2$

10. $g(w)=\sqrt{4w+7}$

Continued on Back $\Rightarrow$

11. $R(t)=\dfrac{3}{t^2}$

Interpretation of the Derivative

For problems 12 – 14 use the derivatives found in the previous part to answer each question.

12. Is $f(x)=1+8x-2x^2$ increasing, decreasing or not changing at $x=0$? What about at $x=6$?

13. Find the equation of the tangent line to $g(x)=4+11x$ at $x=17$.

14. Does $R(t)=\dfrac{3}{t^2}$ ever stop changing? If so when does it stop?