Limits

A. Simplify the following limits:

1. $\lim_{x \to -2} -3x^5 + 4x^3 - 10$

2. $\lim_{x \to -3} \frac{6x^2 - 5}{3 - x}$

3. $\lim_{x \to -4} \frac{x^3 + 64}{x + 4}$

4. $\lim_{x \to 6} \frac{x^2 + 2x - 48}{x - 6}$

5. $\lim_{x \to 0} \frac{\sqrt{x + 25} + 5}{x}$

6. $\lim_{x \to 0} \frac{\sin 6x}{5x}$

7. $\lim_{x \to 0} \frac{\sin(2x)\cos^2 x - \sin(2x)\cos^3 x}{(2x)^2}$

8. $\lim_{x \to 81} \frac{x - 81}{\sqrt{x} - 9}$

9. $\lim_{x \to \infty} \frac{6x^5 - 2x^4 + 4x^2}{3x^2 + 7x^4 - 11x^5 + x^3}$

10. $\lim_{x \to \infty} \frac{3x^4 - 5x^3 + 3}{10x^4 + 2x^2 - 9}$

11. $\lim_{x \to \infty} \frac{-5x^4 - 5x^3 - 2}{4x^6 + 3x^5 + 2x^4 - 9x}$

12, $\lim_{x \to 6^+} \frac{4}{6 - x}$

13. $\lim_{x \to -3^+} \frac{1}{x^2 - x - 12}$

14. $\lim_{x \to -\infty} -x^4 - 8x^2$

15. $\lim_{x \to \infty} \frac{\sqrt{2x^2 + 1}}{3x - 5}$

B. Show that $\lim_{x \to \infty} \sqrt{x^2 + 1} - x = 0$

C. Determine the equation of the tangent line to the curve $f(x) = x^3 + 3x - 7$ at x = -1. **(do not use derivatives)**

D. A ball is thrown into the air with a velocity of 40ft/sec, its height in feet after t seconds is given by $y = 40t - 16t^2$. Find the following:

a) the velocity of the ball at 1 sec.

b) the velocity at 3 sec

c) the maximum height reached by the ball

d) the time it takes for the ball to return to the ground

e) the velocity of the ball when it strikes the ground

E. Identify the three instances when a limit fails to exist.

a)
b)
c)