1. Find the derivative of the following functions.

   (a) $f(x) = 17x^3 - 11x^{5/4} + 6\sqrt{x} + 3 - \dfrac{7}{x^2}$

   (b) $g(x) = (5x^4 + 6\sqrt{x^3} + 3)(2x^2 - 9x + 8)$.

   (c) $h(x) = \dfrac{4x^2 - 3x + 2}{-x^2 + 4}$.

2. Algebraically compute the following limits (do not use tables).

   (a) $\lim\limits_{x\to\infty} \dfrac{3x^5 + 6x^4 - 7x^2 + 11}{4x^6 - 5x^2 + 1}$.

   (b) $\lim\limits_{x\to 7} \dfrac{-3(x-7)}{5(x^2 - 3x - 28)}$.

   (c) $\lim\limits_{x\to-\infty} \dfrac{28x^7 - x^6 + 3x^5 - 7x^4 + 2x^3 + 5x - 1}{21x^7 + 3x^6 - 5x^5 + 11x^4 - 22x^3 - x^2 + 13}$.

3. Suppose the function $f(x)$ is defined to be $\dfrac{3(x+2)}{x^2+x-2}$ whenever $x \neq -2$, and $f(-2) = 0$. Use the definition of continuity to determine whether or not f is continuous at $x = -2$.

4. Let $f(x) = 5\sqrt[3]{x^4}$. Is f differentiable at $x = 0$? Explain your answer.

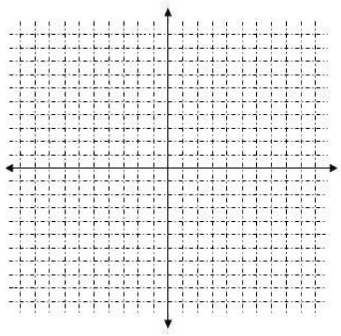
5. Let $g(x) = 3x^2 - 4\sqrt{x} + 2$. Calculate Δy and dy when $x = 1$ and $dx = 0.2$.

6. Let $h(x) = \sqrt[4]{x}$. Use the linear approximation for h to estimate $\sqrt[4]{81.3}$ to 4 decimal places.

7. Let $F(x) = -(x+1)(x-3) = -x^2 + 2x + 3$.

   (a) Find the equation of the line tangent to $F(x)$ at $x = 2$. Write your answer in slope-intercept form.

   (b) Sketch a graph of $y = F(x)$ and the line you found in (a) on the axis below.



8. Alison's House of Chocolate determines that its daily cost function of producing boxes of caramel nut clusters can be modeled by

$$C(x) = -0.21x^2 + 10x + 600$$

where x represents the number of boxes produced each day, and $C(x)$ is the is the total cost, in dollars, of producing the boxes of caramel nut clusters. Evaluate and interpret $MC(10)$.

9. Aaron's House of Seafood determines that the weekly profit from selling crab legs can be modeled by

$$P(x) = -0.03x^3 + 7.2x^2 - 500x + 10000$$

where x represents the number crab legs sold each week, and $P(x)$ is the is the weekly profit, in dollars. Evaluate and interpret $MP(100)$.

10. Suppose a bottle rocket is launched and its height above the ground is given by $s(t) = -16t^2 + 120t + 6$. Here, t is the number of seconds after the rocket is launched and s is measured in feet.

    (a) Determine the velocity function, $v(t)$.

    (b) Evaluate $v(2)$ and interpret.

    (c) When does $v(t) = 0$? Interpret what this means.

    (d) How high is the rocket in the air when $v(t) = 0$?

    (e) At what time does the rocket hit the ground? Round your answer to 2 decimal places.

    (f) About how fast does the rocket hit the ground?