#s 1, 2: Find an equation of the tangent line to the curve at the given point.

1. $y = \dfrac{2x}{x+1}$ @ $(1,1)$

2. $y = x^4 + 2x^2 - x$ @ $(1,2)$

#s 3, 4: Find an equation of the tangent line and the normal.

3. $y = x + \sqrt{x}$ @ $(1,2)$

4. $y = \dfrac{3x+1}{x^2+1}$ @ $(1,2)$

5. Find the first and second derivatives of $f(x) = x^4 - 3x^3 + 16x$

6. The equation of motion for a particle is $s = t^3 - 3t$, where *s* is measured in meters and $t$ is measured in seconds.
   a. Find the velocity and acceleration functions, you *jerk*!
   b. How fast is it accelerating after one second?
   c. Graph the 3 functions on the same set of axes.

7. Show that $y = 6x^3 + 5x - 3$ has no tangent line with a slope of $m = 4$.

8. Find an equation of a normal line to the parabola $y = x^2 - 5x + 4$ that's parallel to the line $x - 3y = 5$

9. Suppose $f(5) = 1,\ f'(5) = 6, g(5) = -3$ and $g'(5) = 2$. Use these facts to evaluate the following:
   a. $(fg)'(5)$
   b. $\left(\dfrac{f}{g}\right)'(5)$
   c. $\left(\dfrac{g}{f}\right)'(5)$

10. If $f(x) = \sqrt{x}g(x), g(4) = 8$ and $g'(4) = 7$, find $f'(4)$.

11. Find a cubic function $f(x) = ax^3 + bx^2 + cx + d$ that has a horizontal tangent @ $(-2,6)$ and $(2,0)$.