Tangent and Normal Lines … Practice Set 2

Learn: Tangent and Normal Lines to a Curve
Recall: Derivative = slope of the Tangent line at that point's *x*-coordinate
Example:

$f(x)=x^2+3 \qquad (1,4)$

$f'(x)=2x \Rightarrow f'(1)=2 \rightarrow$ slope of the tangent line

Tangent Line: $y-4=2(x-1)$

Normal Line: $y-4=-\frac{1}{2}(x-1)$

For each of the following:

a) Sketch a graph - USE GRAPH PAPER!!
b) Find the slope of the tangent line at the given point.
c) Find the equations of the tangent line at the given point. Sketch the line.
d) Find the equation of the normal to the curve at the given point. Sketch the line.

1. $y=x^2-3,\ (2,1)$
2. $f(x)=6-x^2 \quad (2,2)$
3. $f(x)=\sqrt{x},\ (4,2)$
4. $y=2-4x^{-2}, \quad (2,1)$

Find the equations of the tangent and normal lines to the curve at the given *x*-value.

5. $y=(1+2x)^2,\ x=1$
6. $y=x^2(3-x),\ x=-2$
7. $y=x-\sqrt{x},\ x=4$

8. Find the points on the curve $y=2x^3+3x^2-12x+1$ where the tangent is horizontal.

9. For what values of x does the graph of $f(x)=(x^2+1)(x+3)$ have a horizontal tangent?

10. Show that the curve $y=6x^3+5x-3$ has no tangent line with slope 4.

11. Find an equation of the tangent line to the curve $y=x\sqrt{x}$ that is parallel to the line $y=1+3x$.

12. Find equations of both lines that are tangent to the curve $y=1+x^3$ and are parallel to the line $12x-y=1$.

13. Find a parabola with equation $y=ax^2+bx+c$ that has slope 4 at $x=1$, slope -8 at $x=-1$, and passes through the point $(2,15)$.

14. Evaluate $\lim\limits_{\Delta x\to 0}\dfrac{(x+\Delta x)^3-2(x+\Delta x)-(x^3-2x)}{\Delta x}$.