Derivative Practice

Do the first two parts from each question below in groups (the rest are good practice). I'll be walking around to help!

1. Calculate the derivative $f'(x)$.

   (a) $f(x) = \dfrac{x^3 - 6x}{1 + 2x^2}$

   (b) $f(x) = x^2 \cos(x) - x \sin(x)$

   (c) $f(x) = \dfrac{x^2 - 1}{\cos(x)}$

2. Calculate the equation of the tangent line to the curve $y = f(x)$ at a.

   (a) $y = x^2 + \frac{15}{x} - 10$, $a = 5$

   (b) $y = (3x - x^2)(3 - x - x^2)$, $a = 1$

3. Use the quotient rule and trigonometric identities to show that...

   (a) $\dfrac{d}{dx}[\sec(x)] = \sec(x)\tan(x)$

   (b) $\dfrac{d}{dx}[\tan(x)] = \sec^2(x)$

   (c) $\dfrac{d}{dx}[\csc(x)] = -\csc(x)\cot(x)$

   (d) $\dfrac{d}{dx}[\cot(x)] = -\csc^2(x)$

4. Calculate the indicated higher derivative.

   (a) $\dfrac{d^2}{dx^2}\left[\dfrac{\cos(x)}{x}\right]$

   (b) $\dfrac{d^3}{dx^3}[x^2 + 3x - 7]$

   (c) $\dfrac{d^2}{dx^2}[\sec(x)]$

   (d) $\dfrac{d^2}{dx^2}[x\sin(x)]$