Name: Section: 5   6 (circle one)

1. $\dfrac{d}{dx}\left(\tan(x^2 + x)\right)$

2. $\dfrac{d}{dx}\left(x\sin\left(\dfrac{1}{x^2}\right)\right)$

3. $\dfrac{d}{dx}\left(\sec(\sin(x^2))\right)$

4. $\dfrac{d}{dx}\left(\dfrac{\csc^2(\sqrt{x})}{\sqrt{3x+2}}\right)$

5. Given a line with slope m, any line perpendicular to it has slope $\frac{-1}{m}$. The **normal** line to a curve (at a point) is defined to be the unique line perpendicular to the tangent line (at the point). If
$$y^3 + xy + x^2 = 3,$$
find the equations of both the tangent and normal lines to the curve at $(1, 1)$.

6. Suppose an object has a position function $s = p(t) = t^3 - 9t^2 + 24t$ (where s is in meters and t is in seconds. Answer the following questions:

1) When is the object's velocity 0? What is the object's velocity at $t = 0$?

2) When is the object moving forward? Backward?

3) What is the object's acceleration at $t = 4$?

4) When is the object speeding up?