Problem 1. Section 3.3 #108

For the following exercises, find $f'(x)$ for each function.

Here $f(x) = 4x^2 - 7x$. We have $\boxed{f'(x) = 8x - 7}$.

Problem 2. Section 3.3 #110

For the following exercises, find $f'(x)$ for each function.

Here $f(x) = x^4 + \frac{2}{x}$. We have $\boxed{f'(x) = 4x^3 - \frac{2}{x^2}}$.

Problem 3. Section 3.3 #114

For the following exercises, find $f'(x)$ for each function.

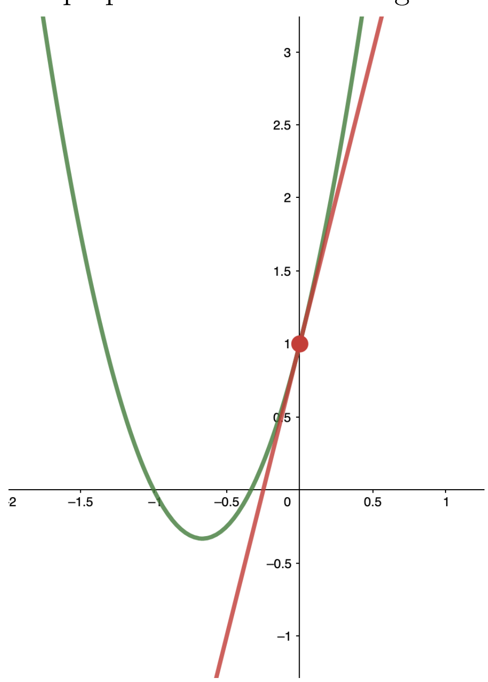
Here $f(x) = \frac{x^3+2x^2-4}{3}$. We have $\boxed{f'(x) = \frac{3x^2+4x}{3}}$.

Problem 4. Section 3.3 #118

For the following exercises, find the equation of the tangent line $T(x)$ the graph of the given function at the indicated point. Graph the function and the tangent line.

Given that $y = 3x^2 + 4x + 1$, we get $\boxed{\frac{dy}{dx} = 6x + 4}$. Therefore, the slope of the tangent function at $(0, 1)$ is $\boxed{\frac{dy}{dx}|_{x=0} = 4}$.

The slope-point form of the tangent line $T(x)$ is simply $\boxed{y - 1 = 4x}$.



Problem 5. Section 3.3 #122

For the following exercises, assume that $f(x)$ and $g(x)$ are both differentiable functions for all x. Find the derivative of each of the functions $h(x)$.

Since $h(x) = 4f(x) + \frac{g(x)}{7}$, we immediately obtain $\boxed{h'(x) = 4f'(x) + \frac{g'(x)}{7}}$.

Problem 6. Section 3.3 #130

For the following exercises, use the following figure to find the indicated derivatives, if they exist.

We know that $h(x) = f(x) + g(x)$, as a result of which, we get $\boxed{h'(x) = f'(x) + g'(x)}$.

a. $\boxed{h'(1) = f'(1) + g'(1) = -1 + 1 = 0}$.

b. $\boxed{h'(3) \text{ does not exist as } f'(3) \text{ does not exist}}$.

c. $\boxed{h'(4) = f'(4) + g'(4) = 1 + 0 = 1}$.

Problem 7. Section 3.3 #138

Find the equation of the tangent line to the graph of $f(x) = x^2 + \frac{4}{x} - 10$ at $x = 8$.

We first figure out the derivative of $f(x)$, which is $\boxed{f'(x) = 2x - \frac{4}{x^2}}$. Then we plug $x = 8$ into the expression to get $\boxed{f'(8) = 16 - \frac{1}{16} = 15\frac{15}{16}}$.

We then identify the point $\boxed{(8, f(8)) = (8, 64 + \frac{1}{2} - 10) = (8, 54\frac{1}{2})}$.

Last we can write down the slope-point form of the tangent line $\boxed{y - 54\frac{1}{2} = 15\frac{15}{16}(x - 8)}$.

Problem 8. Section 3.3 #144

A car driving along a freeway with traffic has traveled $s(t) = t^3 - 6t^2 + 9t$ meters in t seconds.

The velocity of the car is $\boxed{v(t) = s'(t) = 3t^2 - 12t + 9 = 3(t^2 - 4t + 3) = 3(t - 1)(t - 3)}$.

The acceleration of the car is $\boxed{a(t) = v'(t) = 3(2t - 4) = 6(t - 2)}$.

(a) Determine the time in seconds when the velocity of the car is 0.
We solve the equation $v(t) = 0$ for t and we get $\boxed{t = 1}$ or $\boxed{t = 3}$.

(b) Determine the acceleration of the car when the velocity is 0.
When $t = 1$, we have $\boxed{a(1) = 6(1 - 2) = -6}$ and when $t = 3$, we have $\boxed{a(3) = 6(3 - 2) = 6}$.