1. Fill in the derivative rules:

(a) $\frac{d}{dx}[c] = 0$ $y=5,\ y'=0$

(b) $\frac{d}{dx}[x^n] = nx^{n-1}$ $y=x^{50},\ y'=50x^{49}$

(c) $\frac{d}{dx}[c\,f(x)] = c\frac{d}{dx}[f(x)]$ $y=10x^5,\ y'=10\cdot5\cdot x^4=50x^4$

(d) $\frac{d}{dx}[f(x)+g(x)] = \frac{d}{dx}[f(x)]+\frac{d}{dx}[g(x)]$ $y=3x^2+x,\ y'=6x+1$

(e) $\frac{d}{dx}[f(x)-g(x)] = \frac{d}{dx}[f(x)]-\frac{d}{dx}[g(x)]$ $y=3x^2-x,\ y'=6x-1$

(f) $\frac{d}{dx}[e^x] = e^x$ $y=4e^x+5,\ y'=4e^x$

2. Compute derivatives of the following functions using derivative rules. DO NOT USE THE PRODUCT RULE, THE QUOTIENT RULE OR THE CHAIN RULE.

(a) $f(x) = (x-2)(2x+3)$ -4 $+3$ $f'(x)=4x-1$

$=2x^2-x-6$

(b) $g(x) = \frac{x^2}{2} - \frac{2}{x^2} + \frac{1}{\sqrt{2}}$ $g'(x)=x+4x^{-3}$

$=\frac{1}{2}x^2-2x^{-2}+\frac{1}{\sqrt{2}}$

(c) $f(t) = \sqrt{t} - e^t + t^{0.3}$

$= t^{1/2} - e^t + t^{0.3}$

$f'(t) = \frac{1}{2}t^{-1/2} - e^t + 0.3t^{-0.7}$

(d) $f(x) = \dfrac{x^2 + x - 1}{\sqrt{x}}$

$= x^{\frac{3}{2}} + x^{\frac{1}{2}} - x^{-1/2}$

$f'(x) = \frac{3}{2}x^{\frac{1}{2}} + \frac{1}{2}x^{-1/2} + \frac{1}{2}x^{-3/2}$

(e) $V(r) = \frac{4}{3}\pi r^3$

$V'(r) = 4\pi r^2$

(f) $f(x) = e^{x-3}$

$= e^{-3} \cdot e^x$

$f'(x) = e^{-3} \cdot e^x = e^{x-3}$

(g) $H(r) = a^2r^2 + br + c$

$H'(r) = 2a^2r + b$

3. At what point(s) on the curve $y = 3x + x^3$ is the tangent to the curve parallel to the line $y = 6x - 5$?

$y' = 3 + 3x^2 = 6$

$x^2 = 1$

$x = \pm 1$

points: $(1, 4)$

$(-1, -4)$