Chapter 19

MATH 200

(6) $f(x) = \frac{3}{x^4} + \frac{e^x}{3} = 3x^{-4} + \frac{1}{3}e^x$

$f'(x) = -12x^{-4-1} + \frac{1}{3}e^x = \boxed{-\frac{12}{x^5} + \frac{e^x}{3}}$

(8) Find all x for which the tangent to $y = e^x - x$ is horizontal at $(x, e^x - x)$.

Note that $\frac{dy}{dx} = e^x - 1$, so we seek all x for which $e^x - 1 = 0$. Solving this:

$$e^x = 1$$
$$\ln(e^x) = \ln(1)$$
$$x = 0$$

Conclusion The tangent to $y = e^x - x$ is horizontal only at $x = 0$.

Chapter 20

(2) $\frac{d}{dx}\left[e^x\sqrt{x}\right] = \frac{d}{dx}\left[e^x x^{\frac{1}{2}}\right] = e^x x^{\frac{1}{2}} + e^x \frac{1}{2} x^{-\frac{1}{2}} = \boxed{e^x\sqrt{x} + \frac{e^x}{2\sqrt{x}}}$

(8) $\frac{d}{dx}\left[\frac{x^3+x^2+1}{x}\right] = \frac{(3x^2+2x)x - (x^3+x^2+1)\cdot 1}{x^2}$

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