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maths friday afternoons Exam 2. 11/12/2020

Question 3.

a) $\int (x^8 + 2x^2)(3x^2 + x) dx$

$$\int 3x^{10} + x^9 + 6x^4 + 2x^3 dx$$

$$\int 3x^{10} dx = \frac{3x^{11}}{11}$$

$$\int x^9 dx = \frac{x^{10}}{10}$$

$$\int 6x^4 dx = \frac{6x^5}{5}$$

$$\int 2x^3 dx = \frac{2x^4}{2}$$

$$= \frac{3x^{11}}{11} + \frac{x^{10}}{10} + \frac{6x^5}{5} + \frac{x^4}{2} + C$$

b) $\int (e^x + 1)(e^x - 1) dx$

Conjugate of $e^x + 1$: $\frac{e^{2x} - 1}{e^x - 1}$

$$\int \frac{e^{2x} - 1}{e^x - 1} (e^x - 1) dx$$

$$\int e^{2x} - 1 dx \quad \text{sum rule.}$$

$$\int e^{2x} - 1 dx = \int e^{2x} dx - \int 1 dx$$

$$\int e^{2x} dx = \frac{1}{2} e^{2x}$$

$$\int 1 dx = x \quad = \frac{1}{2} e^{2x} - x = \frac{1}{2} e^{2x} - x + C.$$