Question 1:

(a) Use a linear approximation $T_1(x)$ for $f(x) = \dfrac{1}{\sqrt{1+x}}$ to approximate $f(1/10)$. Express your answer as a single simplified fraction.

[5]

(b) Give an error bound for your approximation in part (a). Again, express your answer as a single simplified fraction.

[5]

Question 2:

(a) Find $T_2(x)$, Taylor polynomial of degree 2 for $f(x) = (x+2)e^{(x-1)}$ at $a = 1$.

[5]

(b) Suppose $T_2(x)$ in part (a) is used to approximate $f(9/10)$. Give an error bound on the approximation. Express your answer as a single simplified fraction. (Note: you are not being asked to find the approximation to $f(9/10)$ here, but only the error bound associated with the approximation.)

[5]

Question 3:
Find the Taylor series about $a = -1$ for $f(x) = 1 + 4x + 3x^2 + 2x^3$. You should be able to write all terms of the series.

[5]

Question 4: Find the first four nonzero terms of the Taylor series about $a = -2$ for $g(x) = \dfrac{5}{3 - 2x}$ and state the open interval of convergence. (Hint: think about the Maclaurin series for $\dfrac{1}{1-x}$.)

[5]

Question 5: Find the Maclaurin polynomial of degree 11 for $f(x) = x^2 \arctan(2x^3)$.

[5]

Question 6: Use series (and not L'Hospital's Rule) to find the limit: $\lim_{x \to 0} \frac{e^{x^3} - 1 - x^3}{x^3 \sin(x^3)}$

[5]

Question 7: Find the first three non-zero terms of the Maclaurin series for $f(x) = e^{-x}\cos(x)$.

[5]

Question 8: Find the radius of convergence R and open interval of convergence $\mathcal{I}$ for the power series

$$f(x) = \sum_{k=1}^{\infty} \frac{2^k (x+1)^{2k}}{k^2}$$

[5]