Problem 1: Evaluate the integrals

\[ \int_{0}^{\pi/2} \sin(x)e^{\cos(x)} \, dx \]

\[ \int_{0}^{1} xe^{3x^2} \, dx \]

\[ \int x^2 e^{2x} \, dx \]
Problem 2: Sketch the region bounded by the curves

\[ y = x^2 + 2x + 6 , \quad y = 2x + 1. \]

Label the curves and determine any points of intersection. Find the volume of the solid obtained by rotating this region about the \( x \)-axis. Find the volume of the solid obtained by rotating this region about the \( y \)-axis.
Problem 3: Solve the differential equations:
\[ y' = y \]
\[ y' = xy \]
\[ xyy' = 1 \]
Problem 4: Find a solution of the differential equation that satisfies the given initial condition:

\[ y' = x + 2 \quad y(1) = 5 \]

\[ y' = y \quad y(0) = \pi \]

\[ y' = xy + 2y \quad y(0) = 2 \]

\[ 4yy' = e^{2x} \quad y(0) = 4\sqrt{2} \]
Problem 5: Similar to one of the exercises 8, 9, 10 on page 538, or exercises 11, 12, 13 on page 558.
Problem 6: Give examples sequences satisfying the following conditions:

Give an example of a divergent sequence.

Give an example of nonconstant sequence converging to 5.

Give an example of a strictly decreasing sequence which converges to $\pi$.

Give an example of a nonconstant sequence that converges to 1, and is neither decreasing, nor increasing.

Give an example of a divergent bounded sequence.

Give an example of a convergent sequence which has among its terms the numbers $-2$ and $1$. 
Problem 7: For each of the following sequences/series, decide whether it is divergent or convergent, and if it convergent, find its limit.
Problem 8: Convergent/Divergent Series Testing, radius and interval of convergence of power series.
Problem 9: Application of power series, representation of function as a power series, McLoren and Taylor series
Problem 10: State the Fundamental Theorem of Calculus, the definition of convergent sequence with limit 3, the Integral test for convergence.