Question 1: Calculate the area of the part of the surface $z = 1 + 3x + 2y^2$ that lies above the triangle with vertices $(0,0)$, $(0,1)$ and $(2,1)$.

[10]

Question 2: Evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$ where $\mathbf{F}(x, y, z) = x^2 z\,\mathbf{i} + xy^2\,\mathbf{j} + z^2\,\mathbf{k}$ and C is the curve of intersection of the plane $x + y + z = 1$ and the cylinder $x^2 + y^2 = 9$ oriented counterclockwise if viewed from above.
(Hint: Stokes Theorem.)

[10]

Question 3: Evaluate $\iint_S \mathbf{F} \cdot d\mathbf{S}$ where $\mathbf{F}(x, y, z) = x^4\,\mathbf{i} - x^3z^2\,\mathbf{j} + 4xy^2z\,\mathbf{k}$ and S is the surface of the solid bounded by the cylinder $x^2 + y^2 = 1$ and the planes $z = x + 2$ and $z = 0$.
(Hint: Divergence Theorem.)

[10]

Question 4: Find the general solution (you may leave your answer in implicit form):

$$2xy^3 + e^x + [3x^2y^2 + \sin(y)]y' = 0$$

[5]

Question 5: Find the general solution (state your answer in explicit form):

$$2xy^2 + x^2y' = y^2$$

[5]

Question 6: Find the general solution (state your answer in explicit form):

$$xy' + 2y = 6x^2\sqrt{y}$$

[5]

Question 7: Find the general solution (state your answer in explicit form):

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

[5]