MA 262 Section 596/597 Quiz 1

June Weiland

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Problem 1. Write your name and section number at the top of a full sized sheet of paper.

Problem 2. Find a function $y = f(x)$ satisfying the differential equation and initial condition

$$\frac{dy}{dx} = \frac{1}{\sqrt{x+5}}, \quad y(4) = -1.$$

Solution: We proceed by integrating both sides of the equation to obtain

$$\int dy = \int \frac{1}{\sqrt{x+5}} dx$$
$$y = 2\sqrt{x+5} + c.$$

Since $y(4) = -1$, then we have

$$-1 = y(4) = 2\sqrt{4+5} + c = 6 + c.$$

Hence $c = -7$ and $y = 2\sqrt{x+5} - 7$.

Problem 3. Find the position and velocity of an object moving along a straight line with the given acceleration, initial velocity, and initial position

$$a(t) = -48, \quad v(0) = 60, \quad s(0) = 10.$$

Solution: Since velocity is the integral of acceleration with respect to time we have that

$$v(t) = \int a(t)dt = \int -48dt = -48t + c.$$

Since we are given that $v(0) = 60$, then $60 = v(0) = -48(0) + c$ and hence $c = 60$. Recall that the integral of velocity with respect to time is position and hence

$$s(t) = \int v(t)dt = \int -48t + 60dt = -24t^2 + 60t + c'.$$

Since $s(0) = 10$, then $10 = s(0) = -24(0)^2 + 60(0) + c'$ and hence $c' = 10$. Thus we have $s(t) = -24t^2 + 60t + 10$.