Practice with Transcendental Functions 2-17-2017 ICMAB

1. A particle moves along the x-axis so that at any time $t > 0$ its velocity is given by $v(t) = t \ln t - t$.
   a. Write an expression for the acceleration of the particle.

   b. For what values of t is the particle moving to the right?

   c. What is the minimum velocity of the particle? Show the analysis that leads to your conclusion.

2. A particle moves along the x-axis so that its velocity v at any time t, for $0 \leq t \leq 16$, is given by $v(t) = e^{2 \sin t} - 1$. At time $t = 0$, the particle is at the origin.

   a. During what intervals of time is the particle moving to the left? Give a reason for your answer.

   b. Find the total distance traveled by the particle from $t = 0$ to $t = 4$.

   c. Is there any time t, $0 \leq t \leq 16$, at which the particle returns to the origin? Justify your answer.

A particle moves along the x-axis with velocity at time $t \geq 0$ given by

3. $v(t) = -1 + e^{1-t}$.

a. Find the acceleration of the particle at time t = 3.

b. Is the speed of the particle increasing at time t = 3? Give a reason for your answer.

c. Find all values of t at which the particle changes directions. Justify your answer.

d. Find the total distance traveled by the particle over the time interval $0 \leq t \leq 3$.

4. Let f and g and their inverses f^{-1} and g^{-1} be differentiable functions and let the values of f, g, and the derivatives f′ and g′ at x = 1 and x = 2 be given by the table below:

x	1	2
$f(x)$	2	3
$g(x)$	2	π
$f'(x)$	5	6
$g'(x)$	4	7

Determine the value of each of the following:

a. The derivative of f + g at x = 2.

b. The derivative of fg at x = 2.

c. The derivative of f/g at x = 2.

d. h'(1) where h(x) = f(g(x)).

e. The derivative of g^{-1} at x = 2.

5. A particle moves along the x-axis with acceleration given by $a(t) = 2t - 10 + \frac{12}{t}$ for $t \geq 1$.

a. Write an expression for the velocity v(t), given that v(1) = 9.

b. For what values of t, $1 \leq t \leq 3$, is the velocity a maximum?