Practice:

A particle moves along the x-axis in such a way that its velocity at time t for t ≥0 is given by the following equations: $v(t) = 4tsin(t^2 - 1) + t^{\ln(t+5)}$

a) Initially, is the particle moving left, right or neither? Explain your answer.

t=0 v(0)=0; velocity is 0, so the particle is not moving left or right.

b) Is the acceleration of the particle at t=1.3 positive or negative? Justify your answer.

At t=1.3, v(t) is increasing so acceleration is positive.

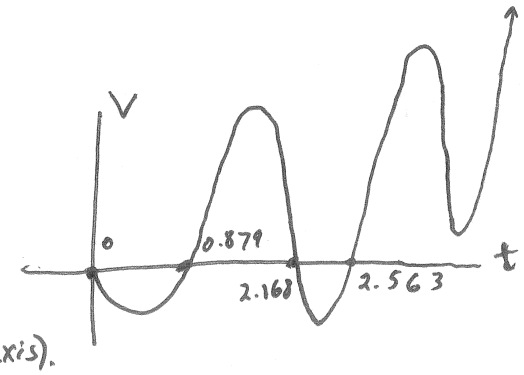
c) Find the average acceleration of the particle on the interval [1, 2]. Show the calculations that lead to your answer.

$$\text{Avg acc} = \frac{v(2)-v(1)}{2-1} = \frac{4.9817677-1}{2-1} = \boxed{3.982}$$

d) Identify all the times on the interval [0, 4] when the particle at rest?

The particle is at rest when v(t)=0; find the zeros.

t=0, t= 0.879, t= 2.168, t= 2.563



e) On what interval(s) is the particle moving to the left?

Particle is moving left when v(t) is negative (below the x-axis).

(0, 0.879) (2.168, 2.563)

f) On what interval(s) is the particle moving to the right?

Particle is moving right when v(t) is positive (above the x-axis).

(0.879, 2.168) (2.563, ∞)

g) On the interval [0, 2] when is the speed of the particle 3? Explain your process.

Speed = |v(t)| = 3 t= 1.169

Graph and find intersections

A particle moves along the x-axis in such a way that its velocity at time t for t ≥0 is given by the following equations: $v(t) = 3\sin(t-1) + \sqrt{t}$

a) At t=1, is the particle moving left, right or standing still? Justify your answer.

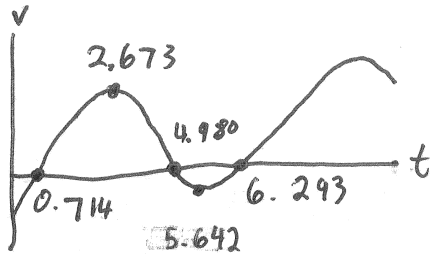
t=1 v(1)= 1; the velocity at t=1 is positive, so the particle is moving to the right.

b) Identify all the times on the interval [0, 8] when the particle changes direction. Explain your reasoning.

Particle changes direction when it changes from moving right to left or vice versa.
In other words, when v(t) changes sign (cross x-axis)
t= 0.714, t= 4.980

c) Find the average acceleration of the particle on the interval [1, 4]. Show the calculations that lead to your answer.

$\text{Avg acc} = \frac{v(4)-v(1)}{4-1} = \frac{2.42336 - 1}{3} = \boxed{0.474}$



d) On the interval [0, 8] identify all the intervals when acceleration is negative. Justify your answer.

Acceleration is negative when velocity is decreasing. If I find the maxes and mins, that will help. Acceleration is negative on (2.673, 5.642). That is when v(t) is decreasing.

e) When is the velocity of the particle zero on the interval [0, 5]?

v(t)=0 at t=0.714, 4.980