Continuing from Friday…

4. An object moves along the x-axis so that at time t, $t \geq 0$, its position is given by $x(t) = t^4 + t^3 - 30t^2 + 88t$. At the instant when the acceleration becomes zero, the velocity of the object is approximately

(A) 244 (B) 12 (C) 0 (D) −12 (E) −24

Plan:
need to find where $a(t) = 0$
and then plug that value of t
into velocity

calc

$Y_1 = t^4 + t^3 - 30t^2 + 88t$ ← $x(t)$

$Y_2 : \frac{d}{dx}(Y_1)\big|_{x=x}$ ← $v(t)$

$Y_3 = \frac{d}{dx}(Y_2)\big|_{x=x}$ ← $a(t)$

$Y_4 = 0$

calc. pt of intersection b/w y_3 and y_4 and store value
A = 1.999...

X sto A

$Y_2(A) = 12.0000..$

Do Now: #5 from Friday's sheet

5. A particle moves along the x-axis so that its position at any time $t \geq 0$ is given by $x(t) = \dfrac{t}{t^2+4}$. The particle is at rest when $t =$

(A) 0 (B) $\frac{1}{4}$ (C) 1 (D) 2 (E) 4

Plan: $v(t) = 0$

6. A particle moves along the x-axis so that its velocity v at time t, for $0 \leq t \leq 5$, is given by $v(t) = \ln\left(t^2 - 3t + 3\right)$. The particle is at position $x = 8$ at $t = 0$. Find the acceleration of the particle at time $t = 4$.

Plan $v'(4)$

$a(4) = .714$

7. An object moves along the x-axis with initial position $x(0) = 2$. The velocity of the object at time $t \geq 0$ is given by $v(t) = \sin\left(\dfrac{\pi}{3}t\right)$. What is the acceleration of the object at time $t = 4$?

$v'(4) = a(4) = -.524$ or $-.523$

8. The position of a particle moving on the x-axis at time $t > 0$ seconds is $x(t) = e^t - \sqrt{t}$.

(a) Find the average velocity of the particle over the interval $1 \le t \le 3$.
(b) In what direction and how fast is the particle moving at $t = 1$ seconds?
(c) For what values of t is the particle moving to the right?
(d) Find the position of the particle when its velocity is zero.

(a) $\frac{x(3) - x(1)}{3 - 1} = 8.317$ or 8.318

(b) $v(1) = 2.218$ to the right

(c) $t > .176$ or $t > .175$

(d) $t = A = .175$ or $.176$

$x(A) = .772$ or $.773$

Homework 10-20

Set D

1. A particle moves along a line so that at time t, where $0 \le t \le \pi$, its position is given by $s(t) = -4\cos t - \frac{t^2}{2} + 10$. What is the velocity of the particle when its acceleration is zero?

(A) -5.19 (B) 0.74 (C) 1.32 (D) 2.55 (E) 8.13

2. If $f(x) = \frac{e^{2x}}{2x}$, then $f'(x) =$

(A) 1 (B) $\frac{e^{2x}(1-2x)}{2x^2}$ (C) e^{2x} (D) $\frac{e^{2x}(2x+1)}{x^2}$ (E) $\frac{e^{2x}(2x-1)}{2x^2}$

3. $\lim_{h \to 0} \frac{\ln(e+h)-1}{h}$ is

(A) $f'(e)$, where $f(x) = \ln x$
(B) $f'(e)$, where $f(x) = \frac{\ln x}{x}$
(C) $f'(1)$, where $f(x) = \ln x$
(D) $f'(1)$, where $f(x) = \ln x$
(E) $f'(0)$, where $f(x) = \ln x$

4. If $f(x) = e^x$, then $\ln(f'(2)) =$

(A) 2 (B) 0 (C) $\frac{1}{e^2}$ (D) $2e$ (E) e^2

$f'(x) = e^x$

$f'(2) = e^2$

$\ln e^2 = 2$

5. The slope of the tangent line to the graph of $y = \ln\left(\frac{x}{2}\right)$ at $x = 4$ is

(A) $\frac{1}{8}$ (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) 1 (E) 4

$y' = \frac{2}{x} \cdot \frac{1}{2} = \frac{1}{x}$ $y'(4) = \frac{1}{4}$

6. If $f(x) = x\ln(x^2)$, then $f'(x) =$

(A) $\ln(x^2)+1$ (B) $\ln(x^2)+2$ (C) $\ln(x^2)+\frac{1}{x}$ (D) $\frac{1}{x^2}$ (E) $\frac{1}{x}$

7. The position of a particle moving along a straight line at any given time t is given by $x(t) = \frac{4}{3}t^3 - 6t^2 + 8t$.

(a) What is the average velocity of the particle for $0 \le t \le 3$?
(b) When is the particle at rest?
(c) During what time interval(s) is the particle moving to the left? Right?

a) 2

b) $t = 1, 2$

c) left: $1 < t < 2$
right: $0 < t < 1$, $t > 2$

$v(t) = 4t^2 - 12t + 8$
$4(t^2 - 3t + 2)$
$4(t-1)(t-2)$