Solutions

MAT 1320 A **Assignment 1** (Due Wed. Sept. 29th, 8:30) **Student Number:**

Problem 1: §1.3 #50

Answers:

(a) $f(g(1)) =$ 5 (b) $g(f(1)) =$ 2 (c) $f(f(1)) =$ 4

(d) $g(g(1)) =$ 3 (e) $(g \circ f)(3) =$ 1 (f) $(f \circ g)(6) =$ 4

Problem 2: §1.5 #30

Work:

a) 3 hours is 6 doubling periods, so $500 \cdot 2^6$

b) $2t$ doublings in t hours, so $500 \cdot 2^{2t}$

c) 40 minutes is $t = 40/60 = 2/3$ hours,

so $500 \cdot 2^{2(2/3)}$

Answers:

(a) number after 3 hours is 32000 (b) number after t hours is $500 \cdot 2^{2t}$

(c) number after 40 minutes is 1260

Problem 3: §1.6 #50

Work:

a) $\ln(x^2-1) = 3$

so $x^2 - 1 = e^3$

or $x^2 = e^3 + 1$

$\therefore x = \pm\sqrt{e^3+1}$

b) $e^{2x} - 3e^x + 2 = 0$

$(e^x - 2)(e^x - 1) = 0$

so $e^x = 2 \Rightarrow x = \ln 2$

or $e^x = 1 \Rightarrow x = 0$

Answers: (a) $x =$ $\pm\sqrt{e^3+1}$ or ± 4.5919

(b) $x =$ 0 or $\ln 2$ or 0 or 0.6931

Problem 4: §2.1 #6

Answers:

(a) (i) on $[1,2]$, $v_{avg} = \dfrac{v(2)-v(1)}{2-1} = \dfrac{12.56-8.14}{1} =$ 4.42 m/s

(ii) on $[1,1.5]$, $v_{avg} = \dfrac{v(1.5)-v(1)}{1.5-1} = \dfrac{10.815-8.14}{0.5} =$ 5.35 m/s

(iii) on $[1,1.1]$, $v_{avg} = \dfrac{v(1.1)-v(1)}{1.1-1} = \dfrac{8.7494-8.14}{0.1} =$ 6.094 m/s

(iv) on $[1,1.01]$, $v_{avg} = \dfrac{v(1.01)-v(1)}{1.01-1} = \dfrac{8.20614-8.14}{0.01} =$ 6.2614 m/s

(v) on $[1,1.001]$, $v_{avg} = \dfrac{v(1.001)-v(1)}{1.001-1} = \dfrac{8.146281-8.14}{0.001} =$ 6.2814 m/s

(b) $v(1) \approx$ 6.28 m/s

Problem 5: §2.6 #14

Work:

a) $v(1) = \lim_{h\to 0} \dfrac{H(1+h)-H(1)}{h} = \lim_{h\to 0} \dfrac{10(1+h)-1.86(1+h)^2-8.14}{h}$

$= \lim_{h\to 0} \dfrac{10+10h-1.86(1+2h+h^2)-8.14}{h} = \lim_{h\to 0} \dfrac{6.28h-1.86h^2}{h}$

$= \lim_{h\to 0} (6.28-1.86h) = 6.28$

b) $v(a) = \lim_{h\to 0} \dfrac{H(a+h)-H(a)}{h} = \lim_{h\to 0} \dfrac{10(a+h)-1.86(a+h)^2-(10a-1.86a^2)}{h}$

$= \lim_{h\to 0} \dfrac{10h-3.72ah-1.86h^2}{h} = 10-3.72a$

c) $H(t) = 10t-1.86t^2 = t(10-1.86t)$ so $H=0$ if $t=0$ or if $t=10/1.86$

d) Same speed going up OR $10-3.72(5.3763) = -10$

Answers:

(a) $v(1) =$ 6.28 m/s (b) $v(a) =$ $10-3.72a$ m/s (c) $t =$ 5.3763 s (d) $v =$ −10 m/s

Problem 6: §2.7 # 44

Answers: (i) position is curve d (ii) velocity is curve c

(iii) acccleration is curve b (iv) jerk is curve a