Math 220 (section AD?) Quiz 8 Spring 2013

Name SOLUTIONS

- You have 15 minutes
- No calculators
- Show sufficient work

1. (4 points) The acceleration due to gravity near the surface of some planet is $-8\ m/s^2$. An object is shot upward from the surface of this planet and 12 seconds later it has fallen back to the surface. What is the velocity of this object 2 seconds after being shot?

(acc) $s''(t) = -8$

(vel) $s'(t) = -8t + C$

(pos) $s(t) = -4t^2 + Ct + D$

$s(0) = 0 \Rightarrow -4(0)^2 + C(0) + D = 0 \Rightarrow D = 0$

$s(t) = -4t^2 + Ct$

$s(12) = 0 \Rightarrow -4(12)^2 + C(12) = 0 \Rightarrow C = \frac{4(12)^2}{12} = 48$

$s(t) = -4t^2 + 48t$

and $s'(t) = -8t + 48$

$s'(2) = -8(2) + 48 = 32\ m/s$

---

alternate solution: object attains its max. height at $t = 6$ sec, Thus $s'(6) = 0 \Rightarrow$

$-8(6) + C = 0 \Rightarrow C = 48$

Thus, $s'(t) = -8t + 48$ and

$s'(2) = 32\ m/s$

2. (4 points) Find a formula for $f(x)$ given that $f''(x) = \dfrac{3+10\sqrt{x}}{\sqrt{x}}$, $f(1) = 14$ and $f'(1) = 18$.

$f''(x) = \frac{3}{\sqrt{x}} + \frac{10\sqrt{x}}{\sqrt{x}} = 3x^{-1/2} + 10$

$f'(x) = 3 \cdot \frac{1}{1/2} x^{1/2} + 10x + C = 6x^{1/2} + 10x + C$

$f'(1) = 18 \Rightarrow 6(1)^{1/2} + 10(1) + C = 18 \Rightarrow C = 2$

$f'(x) = 6x^{1/2} + 10x + 2$

$f(x) = 6 \cdot \frac{1}{3/2} x^{3/2} + 10 \cdot \frac{1}{2} x^2 + 2x + D$

$f(x) = 4x^{3/2} + 5x^2 + 2x + D$

$f(1) = 14 \Rightarrow 4(1)^{3/2} + 5(1)^2 + 2(1) + D = 14 \Rightarrow D = 3$

$f(x) = 4x^{3/2} + 5x^2 + 2x + 3$

3. (2 points) When Carl rode his bicycle yesterday, his speeds were always increasing between noon and 1:00 PM. His speeds are recorded every 15 minutes and listed in the table below.

15 min = $\frac{1}{4}$ hr

Time	12:00	12:15	12:30	12:45	1:00
Speed (miles/hour)	12.5	15.0	20.0	22.0	25.0

(a) Approximate the total distance that Carl traveled between noon and 1:00 PM by using a left Riemann sum with $\Delta t = 15$ minutes.

distance $\approx (12.5 \frac{mi}{hr})(\frac{1}{4} hr) + (15.0 \frac{mi}{hr})(\frac{1}{4} hr) + (20.0 \frac{mi}{hr})(\frac{1}{4} hr) + (22.0 \frac{mi}{hr})(\frac{1}{4} hr)$

distance ≈ 17.375 mi

(b) Approximate the total distance that Carl traveled between noon and 1:00 PM by using a right Riemann sum with $\Delta t = 15$ minutes.

distance $\approx (15.0 \frac{mi}{hr})(\frac{1}{4} hr) + (20.0 \frac{mi}{hr})(\frac{1}{4} hr) + (22.0 \frac{mi}{hr})(\frac{1}{4} hr) + (25.0 \frac{mi}{hr})(\frac{1}{4} hr)$

distance ≈ 20.5 mi