Quiz 2 (20 points in total)
Section 201/202 (circle one)
Name:

1. [6 points] The average weight of a squirrel in Ann Arbor oscillates sinusoidally between a low of 5 pounds on January 1 and a high of 9 pounds on July 1, and a low of 5 pounds on January 1 next year again. Suppose that the function $P(t)$ gives the average weight in pounds of an Ann Arbor squirrel t months after January 1.

a). What is the amplitude of $P(t)$?

$A = \frac{1}{2}(\max - \min) = \frac{1}{2}(9-5) = 2$ lbs. $\quad \left(\text{Midline} = \frac{1}{2}(\max + \min) = \frac{1}{2}(9+5) = 7\right)$

b). What is the period of $P(t)$?

Per = time for 1 cycle (ie low → high → low) = 12 mo (Jan 1 → Jan 1)

c). Find a formula for $P(t)$. need to Horizontal stretch by $\frac{\text{Per}}{2\pi}$ (to make new period = 12)

Amplitude

$$P(t) = -2\cos\left(\boxed{\frac{2\pi}{12}}\, t\right) + 7$$

-cos to make it start @ min

midline

2. [2 points] $f(x) = \sin(x)^x$, write down the limit definition of $f'(3)$. (You don't need to calculate it, just write the definition.)

$$f'(3) = \lim_{h\to 0} \frac{f(3+h) - f(3)}{h} = \lim_{h\to 0} \frac{\sin(3+h)^{3+h} - \sin(3)^3}{h}$$

3. [4 points]The cost, C (in dollars) to produce g gallons of ice cream can be expressed as $C = f(g)$. Assume f is invertible. Interpret

(1) $f'(100) = 2.5$ If we increase our production from 100 gallons of ice cream to 101 gal, cost will increase by about \$2.50

(2) $(f^{-1})'(100) = 2.5$ If we increase our spending (cost) from \$100 up to \$101, we will produce about 2.5 more gallons of ice cream.

Answers may vary. About is essential, as are correct units on all quantities.

4. [6 points]Consider a particle, whose position, s, is given by the table

t (seconds)	0.2	0.4	0.6	0.8	1	1.2	1.4	1.6
S (feet)	0.5	1.4	3.8	6.5	9.6	9.2	8.7	6.1

(1) Estimate the velocity of the particle at $t = 0.2$. (Don't forget the unit)

$v(.2) \approx \frac{s(.4)-s(.2)}{.4-.2} = \frac{1.4-.5}{.4-.2} = \boxed{4.5\ \frac{ft}{sec}}$ [This is avg. vel. from $t=.2$ to $t=.4$]

(2) Use (1) and the table to estimate the position of the particle at $t = 0.17$. (Don't forget the unit)

Tan line @ $t=.2$: $(\underbrace{s-.5}_{s(.2)}) = \underbrace{4.5}_{s'(.2)=v(.2)}(t-.2)$, so $s-.5 = 4.5(.17-.2) = -.135 \rightarrow s = .5-.135 = \boxed{.365\ ft}$

(3) For which t, does the velocity appear to be positive?

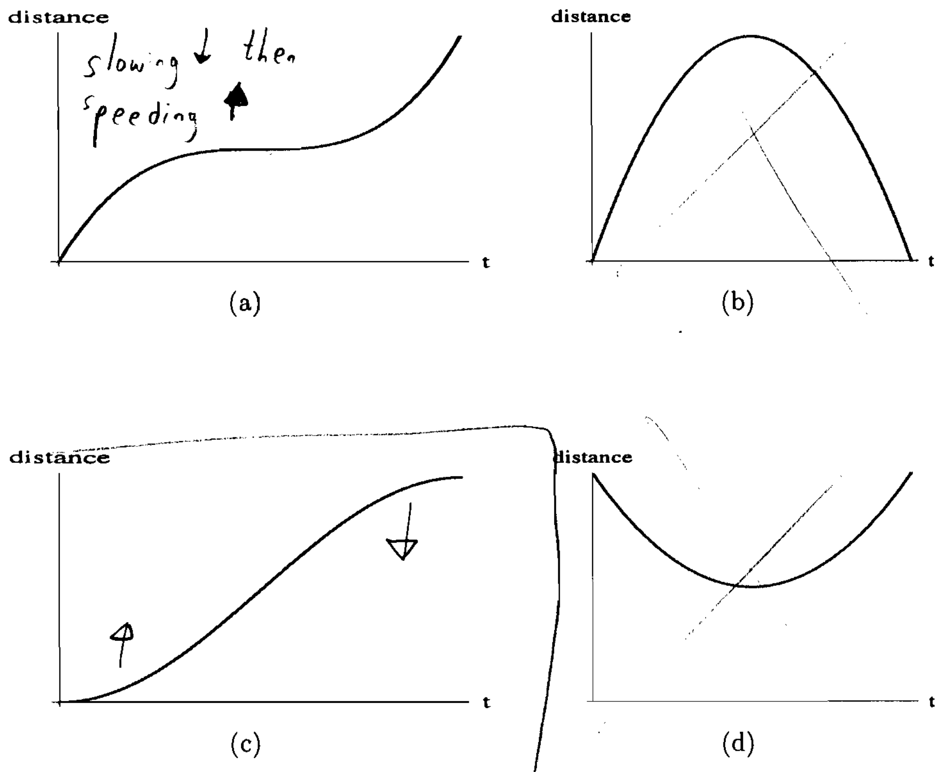
$t<1$ sec ($s(t)$ gets bigger as t gets bigger UNTIL $t=1$sec).

5.[2 points] See figure 1, which graph represents the position of an object that is speeding up and then slowing down?

Answer: concave ↑ then concave ↓

$\boxed{C}$

Figure 1: Problem 5



Both involve turning around, No inflection pts.