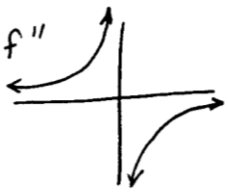
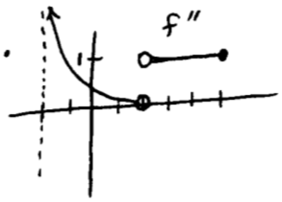
Assignment 13 $f' \to f''$, $f' \to f$, Interp. of Rate Graphs

1. f''


2. f''


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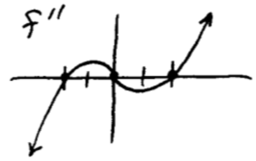

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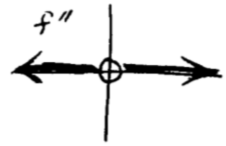
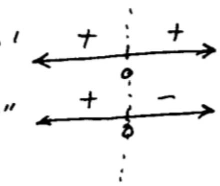


5. f', f''


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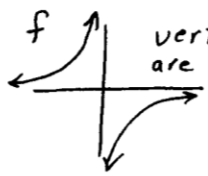
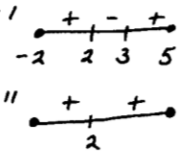


vert. shifts are ok

6. f', f''


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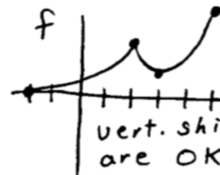
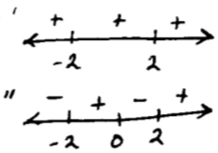


vert. shifts are OK.
Could be hole or jump at $x=2$.

7. f', f''


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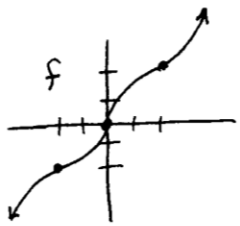
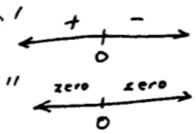


8. f', f''


f


9. a. At the beginning of 1992, the birth rate in the Utah city was 3 thousand births per year.

b. $2(2.2+3) = 10.4$

c. From the beginning of 1992 to the beginning of 1996, approximately 10,400 babies were born in the Utah city.

d.

Method 1	Method 2	Method 3 (the most accurate)
using (4,2) and (5,3)	using (5,3) and (6,3.5)	using (4,2) and (6,3.5)
$b'(5) \approx \frac{3-2}{5-4} = 1$	$b'(5) \approx \frac{3.5-3}{6-5} = .5$	$b'(5) = \frac{3.5-2}{6-4} = .75$

e. At the beginning of 1995, the birth rate in the Utah city was increasing at the rate of .75 (or 1 or .5) <u>thousand births per year per year</u>. (This could be written as 750 births per year per year.)

Interpretation of Rate Graphs (cont.)

10. a. Three miles from the trailhead the density of hikers on the trail was 30 hikers per mile.

b. There are a total of 110 hikers on the first three miles of the trail.

c. $(3, 30)$ $m = -6$ $\quad \underbrace{y - 30 = -6(x-3)}_{\text{Tangent Line}} \rightarrow y = -6(x-3) + 30$

$y(3.1) = -6(3.1-3) + 30 = 29.4 \longrightarrow D(3.1) \approx 29.4$ hikers/mile

d. $\int_0^6 D(x)\,dx$

e. $\int_0^6 D(x)\,dx \approx \frac{1}{2}\cdot 1\,(41 + 2\cdot 40 + 2\cdot 35 + 2\cdot 30 + 2\cdot 25 + 2\cdot 20 + 19)$

$= 180$ hikers

f. $D_{avg} = \dfrac{\int_0^6 D(x)\,dx}{6-0} \approx \dfrac{180}{6} = 30$ hikers/mile

11. a. First find the equation for $a(t)$ on the interval $[0, 3]$.

$m = \frac{10}{3}$ point $(0,0) \longrightarrow a = \frac{10}{3}t$

$a(2) = \frac{10}{3}\cdot 2 = \boxed{\frac{20}{3}\ \text{ft/sec}^2}$

b. $3\text{sec} \le t \le 4\text{ sec}$

c. -5 ft/sec^2 (at the lowest point on the graph)

d. $v(6) =$ initial vel. $+$ velocity accumulated in the six seconds

$v(6) = 0 + \int_0^6 a(t)\,dt$

$= 0 + \frac{1}{2}\cdot 10\,(6+1) = \boxed{35\ \text{ft/sec}}$

area of a trapezoid

e. $v(6) = 20 + \int_0^6 a(t)\,dt$

$= 20 + 35 = \boxed{55\ \text{ft/sec}}$

f. $v(7) = 20 + \int_0^6 a(t)\,dt + \int_6^7 a(t)\,dt$

$= 20 + 35 - \frac{1}{2}\cdot 1\cdot 5 = \boxed{52.5\ \text{ft/sec}}$