Webwork 9 Problem 11.

The manager of a large apartment complex knows from experience that 100 units will be occupied if the rent is \$450 / month. A market survey suggested that, on the average, one additional unit will remain vacant for each \$1 increase in rent. Similarly ⋯.
Find the rent that maximizes the revenue.

	Units rent	Rent
Original	100.	450
Rent +1.	100 − 1	450 + 1.
Rent +2	100 − 2	450 + 2 ⇒
	⋮	⋮
Rent +x.	100 − x	450 + x.

Let x be the change of rent. Then the revenue

$$\boxed{\begin{gathered} R(x) = (100-x)(450+x) \\ -450 \le x \le 100. \end{gathered}}$$

$$R'(x) = 100 - x + (-1)(450+x) = 100 - x - 450 - x$$

$$= -350 - 2x = 0 \Rightarrow x = -175.$$

Compare: $R(-450) = 0$. $R(100) = 0$.

$R(-175) = 275 \times 275 > 0 \Rightarrow R(-175)$ Abs. max

Answer: Revenue is maximized when the rent is $450-175=275$.

Webwork 9 Problem 4:

Evaluate $\lim_{t\to\infty} \frac{2t-9}{\sqrt{t^2+9t+5}}$.

Rmk: If l'Hôpital, then circular!

Solution: $\lim_{t\to\infty} \frac{2t-9}{\sqrt{t^2+9t+5}} = \lim_{t\to\infty} \frac{(2t-9)\frac{1}{t}}{\sqrt{t^2+9t+5}\cdot\frac{1}{t}} = \lim_{t\to\infty} \frac{2-\frac{9}{t}}{\sqrt{1+\frac{9}{t}+\frac{5}{t^2}}}$

$$= \frac{2-0}{\sqrt{1+0+0}} = 2.$$

Webwork 10 Problem 9:

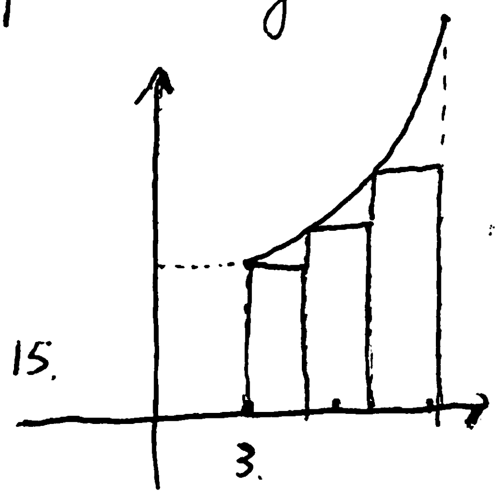
$$\int_4^8 (10x+7)\,dx = \int_4^8 10x\,dx + \int_4^8 7\,dx = (5x^2+7x)\Big|_4^8$$

$$= 5\times(8^2-4^2) + 7\times(8-4) = 240+28 = 268$$

Rmk: $\int 1\,dx = x+C$. Don't mess up with $\frac{d}{dx}1=0$.

Webwork 10. Problem 1:

Estimate the area under the graph of $f(x)=x^2+2x$ from $x=3$ to $x=9$ using 3 approximating rectangles and left endpoints:



1st rectangle ~~triangle~~: x from 3 to 5.

$$\text{height} = f(3) = 3^2+2\times 3 = 15.$$

$$\text{Area}: \cancel{A(1)}\ A_1 = \cancel{\$}\, f(3)(5-3) = 15\times 2 = 30.$$

2nd rectangle ~~triam~~: x from 5 to 7.

$$\text{height} = f(5) = 5^2+2\times 5 = 35.$$

$$\text{Area}: A_2 = 35\times(7-5) = 70.$$

3rd rectangle: x from 7 to 9.

$$\text{height} = f(7) = 7^2+2\times 7 = 63.$$

$$\text{Area}: A_3 = 63\times(9-7).$$

Total area: $A = A_1+A_2+A_3 = 30+70+63 = 163.$