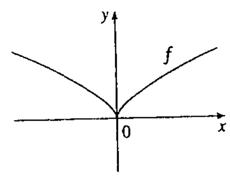
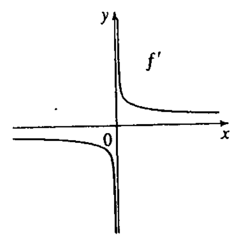
Homework 7

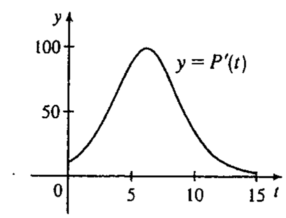
Section 2.8:

8.

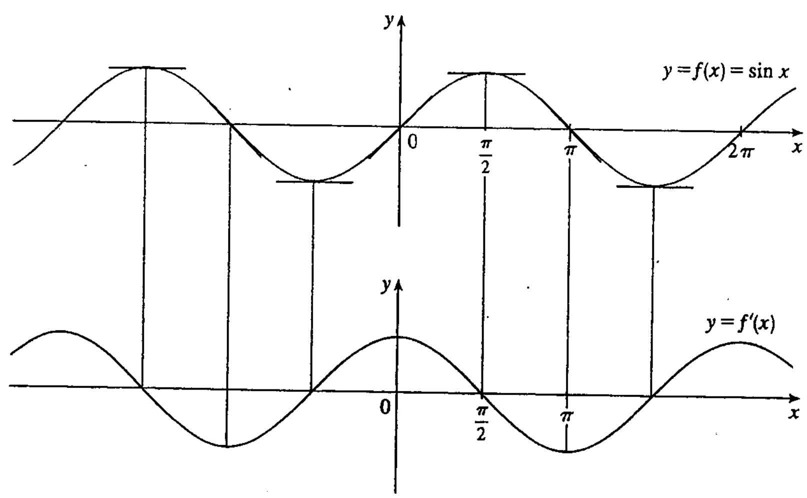




12. The slopes of the tangent lines on the graph of $y = P(t)$ are always positive, so the y-values of $y = P'(t)$ are always positive. These values start out relatively small and keep increasing, reaching a maximum at about $t = 6$. Then the y-values of $y = P'(t)$ decrease and get close to zero. The graph of P' tells us that the yeast culture grows most rapidly after 6 hours and then the growth rate declines.



16.



24. $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = \lim_{h\to 0} \frac{[1.5(x+h)^2-(x+h)+3.7]-(1.5x^2-x+3.7)}{h}$

$= \lim_{h\to 0} \frac{1.5x^2+3xh+1.5h^2-x-h+3.7-1.5x^2+x-3.7}{h} = \lim_{h\to 0} \frac{3xh+1.5h^2-h}{h}$

$= \lim_{h\to 0}(3x+1.5h-1) = 3x-1$

Domain of f = domain of $f' = \mathbb{R}$.

Section 3.1:

18. $y = \sqrt{x}\,(x-1) = x^{3/2} - x^{1/2} \Rightarrow y' = \frac{3}{2}x^{1/2} - \frac{1}{2}x^{-1/2} = \frac{1}{2}x^{-1/2}(3x-1)$ [factor out $\frac{1}{2}x^{-1/2}$]
or $y' = \dfrac{3x-1}{2\sqrt{x}}$.

24. $g(u) = \sqrt{2}\,u + \sqrt{3u} = \sqrt{2}\,u + \sqrt{3}\,\sqrt{u} \Rightarrow g'(u) = \sqrt{2}\,(1) + \sqrt{3}\left(\frac{1}{2}u^{-1/2}\right) = \sqrt{2} + \frac{\sqrt{3}}{2\sqrt{u}}$

34. $y = x^4 + 2x^2 - x \Rightarrow y' = 4x^3 + 4x - 1$. At $(1, 2)$, $y' = 7$ and an equation of the tangent line is $y - 2 = 7(x-1)$ or $y = 7x - 5$.

44. $G(r) = \sqrt{r} + \sqrt[3]{r} \Rightarrow G'(r) = \frac{1}{2}r^{-1/2} + \frac{1}{3}r^{-2/3} \Rightarrow G''(r) = -\frac{1}{4}r^{-3/2} - \frac{2}{9}r^{-5/3}$