

Homework 16

Section 3.10:

2. $f(x) = \sin x \Rightarrow f'(x) = \cos x$, so $f(\frac{\pi}{6}) = \frac{1}{2}$ and $f'(\frac{\pi}{6}) = \frac{1}{2}\sqrt{3}$. Thus,

$$L(x) = f(\frac{\pi}{6}) + f'(\frac{\pi}{6})(x - \frac{\pi}{6}) = \frac{1}{2} + \frac{1}{2}\sqrt{3}(x - \frac{\pi}{6}) = \frac{1}{2}\sqrt{3}x + \frac{1}{2} - \frac{1}{12}\sqrt{3}\pi.$$

26. $y = f(x) = 1/x \Rightarrow dy = -1/x^2 dx$. When $x = 4$ and $dx = 0.002$, $dy = -\frac{1}{16}(0.002) = -\frac{1}{8000}$, so

$$\frac{1}{4.002} \approx f(4) + dy = \frac{1}{4} - \frac{1}{8000} = \frac{1999}{8000} = 0.249875.$$

34. (a) $A = \pi r^2 \Rightarrow dA = 2\pi r dr$. When $r = 24$ and $dr = 0.2$, $dA = 2\pi(24)(0.2) = 9.6\pi$, so the maximum possible error in the calculated area of the disk is about $9.6\pi \approx 30 \text{ cm}^2$.

(b) Relative error = $\frac{\Delta A}{A} \approx \frac{dA}{A} = \frac{2\pi r dr}{\pi r^2} = \frac{2 dr}{r} = \frac{2(0.2)}{24} = \frac{0.2}{12} = \frac{1}{60} = 0.01\bar{6}$.

Percentage error = relative error $\times 100\% = 0.01\bar{6} \times 100\% = 1.6\bar{6}\%$.

44. (a) $g'(x) = \sqrt{x^2 + 5} \Rightarrow g'(2) = \sqrt{9} = 3$. $g(1.95) \approx g(2) + g'(2)(1.95 - 2) = -4 + 3(-0.05) = -4.15$.

$$g(2.05) \approx g(2) + g'(2)(2.05 - 2) = -4 + 3(0.05) = -3.85.$$

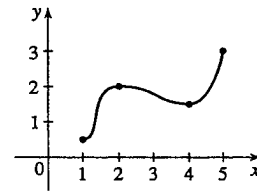
(b) The formula $g'(x) = \sqrt{x^2 + 5}$ shows that $g'(x)$ is positive and increasing. This means that the slopes of the tangent lines are positive and the tangents are getting steeper. So the tangent lines lie *below* the graph of g . Hence, the estimates in part (a) are too small.

Section 4.1:

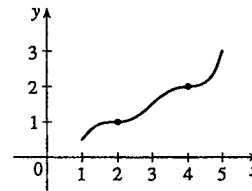
4. Absolute maximum at r ; absolute minimum at a ; local maxima at b and r ; local minimum at d ; neither a maximum nor a minimum at c and s .

6. There is no absolute maximum value; absolute minimum value is $g(4) = 1$; local maximum values are $g(3) = 4$ and $g(6) = 3$; local minimum values are $g(2) = 2$ and $g(4) = 1$.

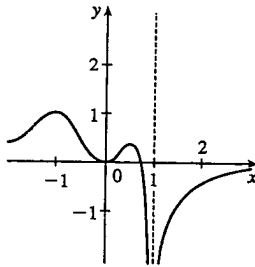
8. Absolute minimum at 1, absolute maximum at 5, local maximum at 2, local minimum at 4



10. f has no local maximum or minimum, but 2 and 4 are critical numbers



14. (a)



(b)

