4.4: 48. $\lim_{x\to\infty} x^{3/2}\sin(1/x)$

$\lim_{x\to\infty} x^{3/2} = \infty$, $\lim_{x\to\infty} \sin\left(\frac{1}{x}\right) = 0$

type: $\infty \cdot 0$

$$\lim_{x\to\infty} x^{3/2}\sin\left(\frac{1}{x}\right) = \lim_{x\to\infty} \frac{\sin\left(\frac{1}{x}\right)}{x^{-3/2}} =$$

$$\lim_{x\to\infty} \frac{\cos\left(\frac{1}{x}\right)(-x^{-2})}{-\frac{3}{2}x^{-\frac{5}{2}}} =$$

$$\lim_{x\to\infty} \cos\left(\frac{1}{x}\right)\left(\frac{2}{3}\right)x^{-2+\frac{5}{2}} =$$

$$\lim_{x\to\infty} \frac{2}{3}\cos\left(\frac{1}{x}\right)x^{\frac{1}{2}} =$$

$$\frac{2}{3}\lim_{x\to\infty} \sqrt{x} = \infty$$

4.4: 54. $\lim_{x\to 0^+}\left(\frac{1}{x} - \frac{1}{\tan^{-1}x}\right)$, $\lim_{x\to 0^+}\frac{1}{x} = \infty$, $\lim_{x\to 0^+}\frac{1}{\tan^{-1}x} = \infty$

type: $\infty - \infty$

$$\lim_{x\to 0^+} \frac{\tan^{-1}x - x}{x\tan^{-1}x} \quad \text{type: } \frac{0}{0}$$

$$\lim_{x\to 0^+} \frac{\tan^{-1}x - x}{x\tan^{-1}x} = \lim_{x\to 0^+} \frac{\frac{1}{1+x^2} - 1}{\tan^{-1}x + \frac{x}{1+x^2}} = 0$$

4.7: 22 $D = d^2 = (x-3)^2 + (\sqrt{x}-0)^2 =$

$x^2 - 6x + 9 + x$

$D' = 2x - 5 = 0$

$2x = 5$

$x = \frac{5}{2}$

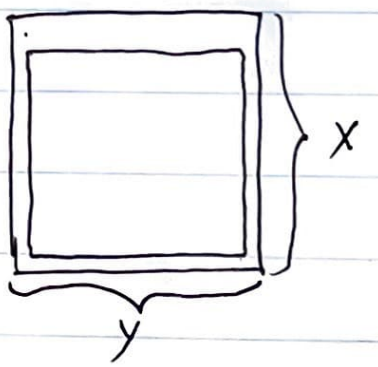
When $x > \frac{5}{2}$, $D' > 0$

When $x < \frac{5}{2}$, $D' < 0$

D decreases then increases.

$D(\frac{5}{2})$ is the minimum, the point is $(\frac{5}{2}, \sqrt{\frac{5}{2}})$

4.7: 36.



$xy = 180$, $y = \frac{180}{x}$

$(x-3)(y-2) = A$

$A = xy - 3y - 2x + 6 =$

$180 - 3(\frac{180}{x}) - 2x + 6 =$

$186 - 2x - \frac{540}{x}$

$A' = -2 - 540(-x^{-2}) = 0$

$A' = \frac{540}{x^2} - 2$,

$A' > 0$ when $x^2 < 270$

$A' < 0$ when $x^2 > 270$

A first increases, then decreases

$2x^2 = 540$

$x^2 = 270$

$x = \pm\sqrt{270}$

$= 13\sqrt{30}$

$y = \frac{180}{3\sqrt{30}} = 2\sqrt{30}$

The dimension is $x = 3\sqrt{30}$, $y = 2\sqrt{30}$