

Lista 3 - Estática

1) Encontre o centroide das figuras abaixo. O gabarito com centroides conhecidos está no final da lista.

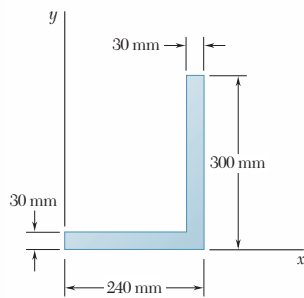


Fig. P5.1

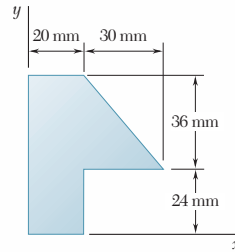


Fig. P5.2

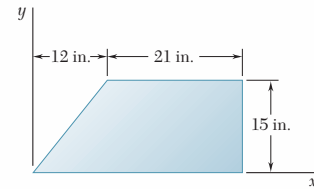


Fig. P5.3

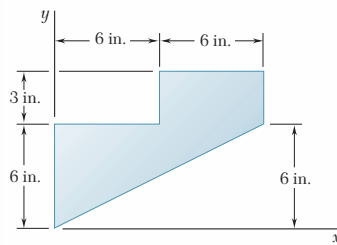


Fig. P5.4

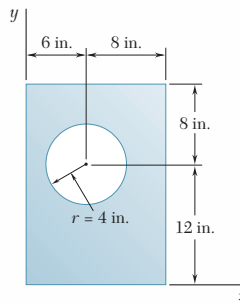


Fig. P5.5

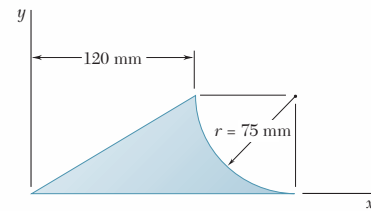


Fig. P5.6

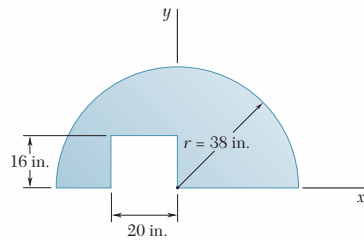


Fig. P5.7

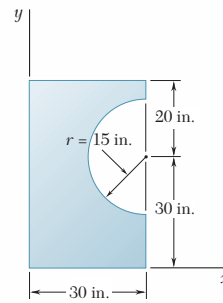


Fig. P5.8

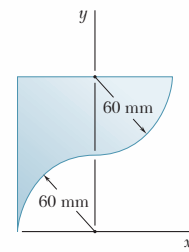


Fig. P5.9

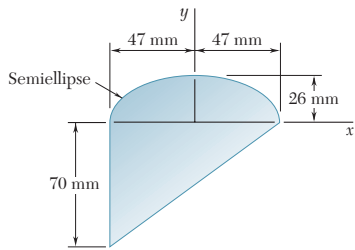


Fig. P5.10

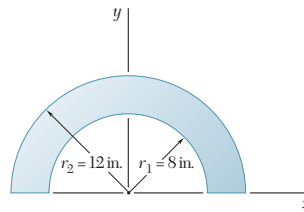


Fig. P5.11

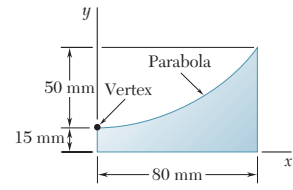


Fig. P5.12

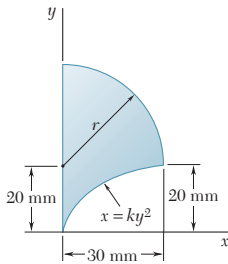


Fig. P5.13

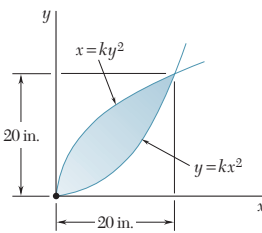


Fig. P5.14

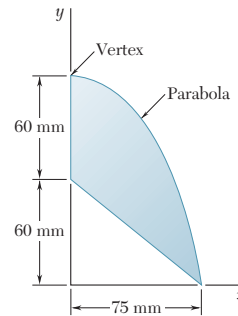
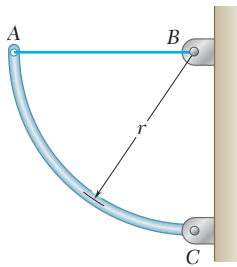


Fig. P5.15

2) A barra circular abaixo está presa por um pino em C e um cabo AB . Determine a reação em C e a tensão no cabo, dados que a barra pesa 4 kg e $r = 25$ cm.



3) Determine por integração os centroides das figuras abaixo (5.45 e 5.46 são fios delgados):

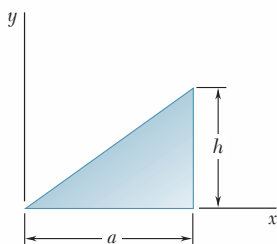


Fig. P5.34

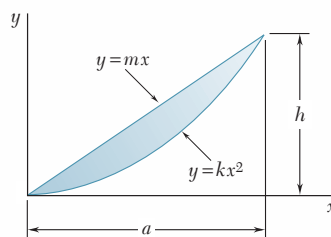


Fig. P5.35

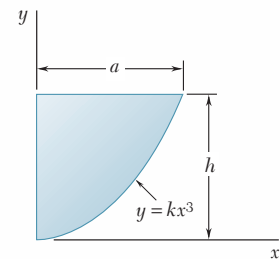


Fig. P5.36

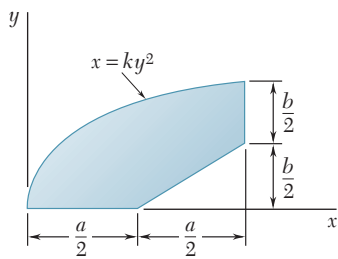


Fig. P5.43

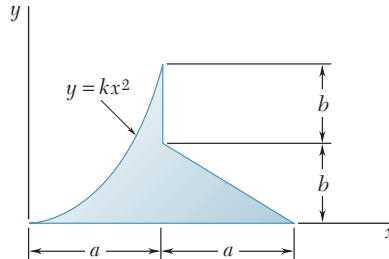


Fig. P5.44

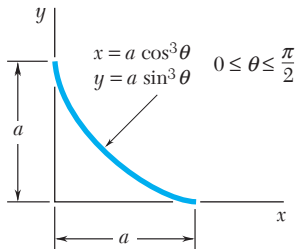


Fig. P5.45

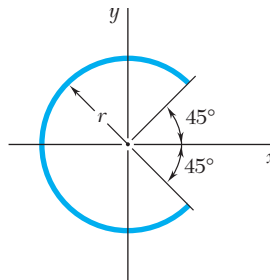


Fig. P5.46

4) Determine as reações nos suportes das cargas abaixo:

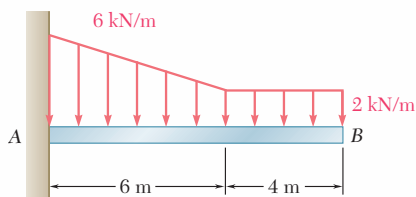


Fig. P5.68

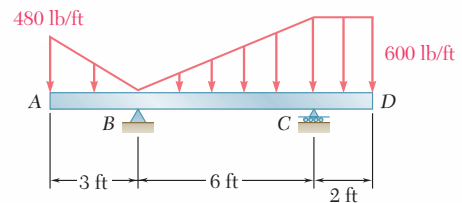


Fig. P5.69

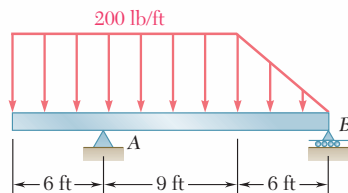


Fig. P5.70

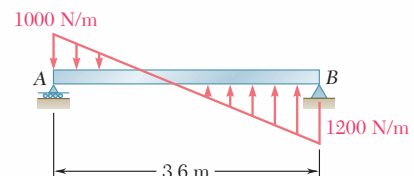


Fig. P5.71

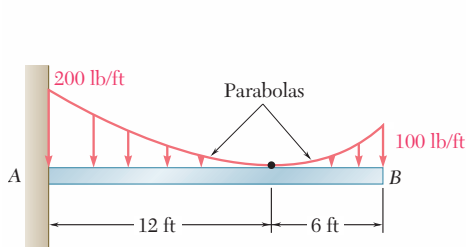


Fig. P5.72

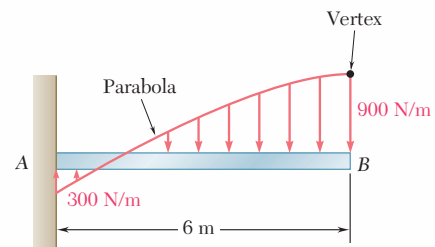


Fig. P5.73

5) A seção reta de uma represa é ilustrada abaixo. Para uma região de 1 m de largura da represa, determine (a) a força resultante exercida pelo solo na base AB, (b) o ponto

de aplicação desta resultante, (c) a resultante da força causada pela pressão na face BC da represa.

Densidade da água: 10^3 kg/m^3 . Densidade do concreto: $2.4 \times 10^3 \text{ kg/m}^3$.

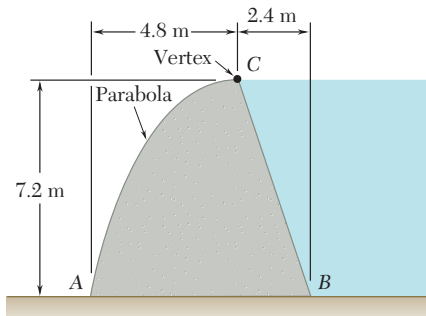
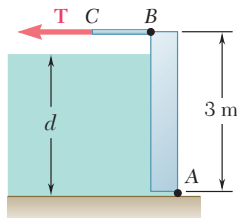


Fig. P5.80

6) A parede AB de um tanque tem $3 \times 4 \text{ m}$, é articulada por uma dobradiça em A e segura por um cabo em B . O cabo suporta no máximo uma tensão de 200 kN . Calcule a maior altura de água d para que o cabo não se parta.



7) Determine as forças internas em função de $0 < \alpha < 90^\circ$ no ponto J da estrutura abaixo.

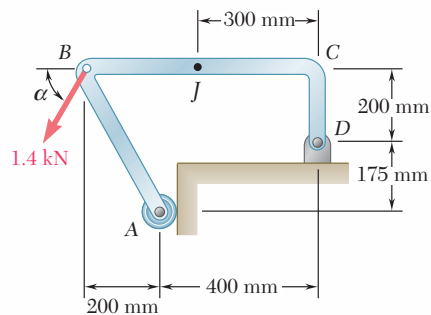


Fig. P7.3 and P7.4

8) Determine as forças internas nos pontos J e K da estrutura abaixo.

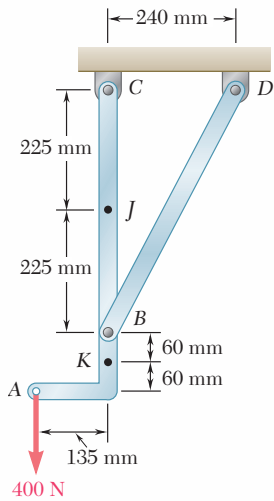


Fig. P7.5 and P7.6

9) Uma barra em formato de quarto de círculo de peso P e seção uniforme é suspensa conforme a figura abaixo. Determine o momento fletor no ponto J , em função de θ .

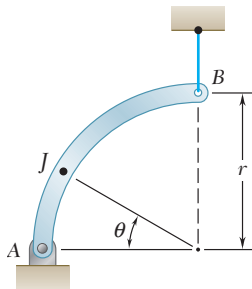


Fig. P7.25

10) Desenhe os diagramas de esforço cortante e momento fletor das vigas abaixo. Encontre os pontos onde estes valores são máximos.

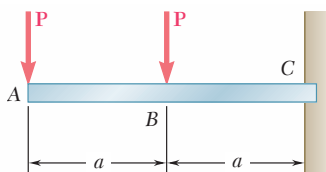


Fig. P7.29

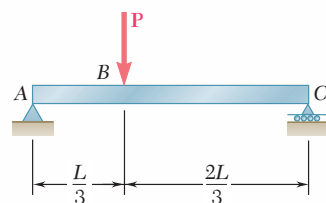


Fig. P7.30

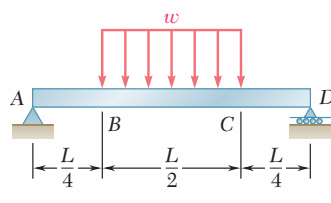


Fig. P7.31

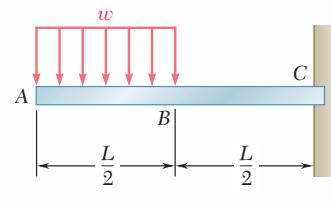


Fig. P7.32

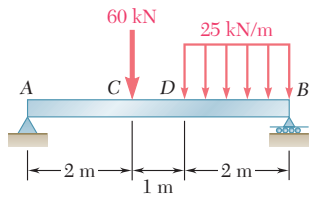


Fig. P7.39

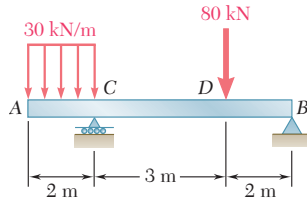


Fig. P7.40

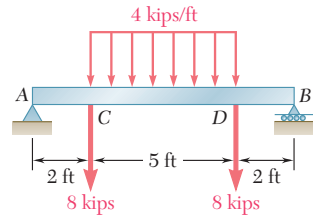


Fig. P7.41

11) Considerando a reação do solo como uniformemente distribuída, desenhe e determine os diagramas de esforço cortante e momento fletor das vigas abaixo. Encontre os pontos onde esses valores são máximos.

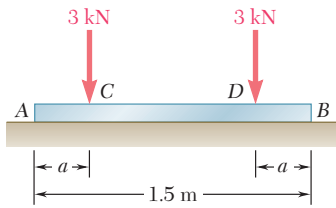


Fig. P7.43

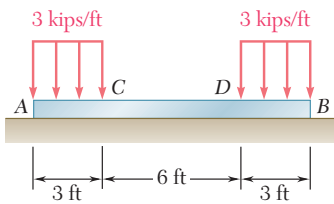


Fig. P7.45

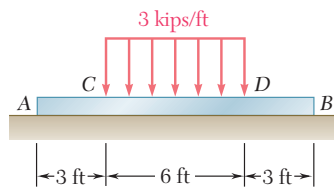


Fig. P7.46

Gabarito de centroides

Shape		\bar{x}	\bar{y}	Area
Triangular area			$\frac{h}{3}$	$\frac{bh}{2}$
Quarter-circular area		$\frac{4r}{3\pi}$	$\frac{4r}{3\pi}$	$\frac{\pi r^2}{4}$
Semicircular area		0	$\frac{4r}{3\pi}$	$\frac{\pi r^2}{2}$
Quarter-elliptical area		$\frac{4a}{3\pi}$	$\frac{4b}{3\pi}$	$\frac{\pi ab}{4}$
Semielliptical area		0	$\frac{4b}{3\pi}$	$\frac{\pi ab}{2}$
Semiparabolic area		$\frac{3a}{8}$	$\frac{3h}{5}$	$\frac{2ah}{3}$
Parabolic area		0	$\frac{3h}{5}$	$\frac{4ah}{3}$
Parabolic spandrel		$\frac{3a}{4}$	$\frac{3h}{10}$	$\frac{ah}{3}$
General spandrel		$\frac{n+1}{n+2} a$	$\frac{n+1}{4n+2} h$	$\frac{ah}{n+1}$
Circular sector		$\frac{2r \sin \alpha}{3\alpha}$	0	αr^2
Quarter-circular arc		$\frac{2r}{\pi}$	$\frac{2r}{\pi}$	$\frac{\pi r}{2}$
Semicircular arc		0	$\frac{2r}{\pi}$	πr
Arc of circle		$\frac{r \sin \alpha}{\alpha}$	0	$2\alpha r$