

IMM - DTU

02405 Probability

2003-12-5

BFN/bfn

Question a) We apply the method used to derive the distribution of ratios

IMM - DTU

02405 Probability

2003-12-5

BFN/bfn

Question a) We apply the method used to derive the distribution of ratios page 382.

IMM - DTU

02405 Probability

2003-12-5

BFN/bfn

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

IMM - DTU

02405 Probability

2003-12-5

BFN/bfn

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz)$$

IMM - DTU

02405 Probability

2003-12-5

BFN/bfn

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

IMM - DTU

02405 Probability

2003-12-5

BFN/bfn

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382

IMM - DTU

02405 Probability

2003-12-5

BFN/bfn

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves

IMM - DTU

02405 Probability

2003-12-5

BFN/bfn

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$.

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right)$$

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z)$$

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z) = \int_x \frac{1}{x} f \left(x, \frac{z}{x} \right) dx$$

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z) = \int_x \frac{1}{x} f \left(x, \frac{z}{x} \right) dx$$

Question b) This part follows more or less directly from page 372,

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z) = \int_x \frac{1}{x} f \left(x, \frac{z}{x} \right) dx$$

Question b) This part follows more or less directly from page 372, such that $Z = X - Y$ has density

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z) = \int_x \frac{1}{x} f \left(x, \frac{z}{x} \right) dx$$

Question b) This part follows more or less directly from page 372, such that $Z = X - Y$ has density

$$f_Z(z)$$

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z) = \int_x \frac{1}{x} f\left(x, \frac{z}{x}\right) dx$$

Question b) This part follows more or less directly from page 372, such that $Z = X - Y$ has density

$$f_Z(z) = \int_x f(x, x - z) dx$$

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z) = \int_x \frac{1}{x} f\left(x, \frac{z}{x}\right) dx$$

Question b) This part follows more or less directly from page 372, such that $Z = X - Y$ has density

$$f_Z(z) = \int_x f(x, x - z) dx$$

Question c) Introduce $W = 2Y$.

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z) = \int_x \frac{1}{x} f\left(x, \frac{z}{x}\right) dx$$

Question b) This part follows more or less directly from page 372, such that $Z = X - Y$ has density

$$f_Z(z) = \int_x f(x, x - z) dx$$

Question c) Introduce $W = 2Y$. The density $f_W(w)$ of W is

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z) = \int_x \frac{1}{x} f\left(x, \frac{z}{x}\right) dx$$

Question b) This part follows more or less directly from page 372, such that $Z = X - Y$ has density

$$f_Z(z) = \int_x f(x, x - z) dx$$

Question c) Introduce $W = 2Y$. The density $f_W(w)$ of W is $\frac{1}{2}f_Y(w)$ from the linear change of variable principle;

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z) = \int_x \frac{1}{x} f\left(x, \frac{z}{x}\right) dx$$

Question b) This part follows more or less directly from page 372, such that $Z = X - Y$ has density

$$f_Z(z) = \int_x f(x, x - z) dx$$

Question c) Introduce $W = 2Y$. The density $f_W(w)$ of W is $\frac{1}{2}f_Y(w)$ from the linear change of variable principle; see e.g. page 333.

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z) = \int_x \frac{1}{x} f\left(x, \frac{z}{x}\right) dx$$

Question b) This part follows more or less directly from page 372, such that $Z = X - Y$ has density

$$f_Z(z) = \int_x f(x, x - z) dx$$

Question c) Introduce $W = 2Y$. The density $f_W(w)$ of W is $\frac{1}{2}f_Y(w)$ from the linear change of variable principle; see e.g. page 333. We now apply the general convolution result

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z) = \int_x \frac{1}{x} f\left(x, \frac{z}{x}\right) dx$$

Question b) This part follows more or less directly from page 372, such that $Z = X - Y$ has density

$$f_Z(z) = \int_x f(x, x - z) dx$$

Question c) Introduce $W = 2Y$. The density $f_W(w)$ of W is $\frac{1}{2}f_Y(w)$ from the linear change of variable principle; see e.g. page 333. We now apply the general convolution result page 372 or page 386

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z) = \int_x \frac{1}{x} f\left(x, \frac{z}{x}\right) dx$$

Question b) This part follows more or less directly from page 372, such that $Z = X - Y$ has density

$$f_Z(z) = \int_x f(x, x - z) dx$$

Question c) Introduce $W = 2Y$. The density $f_W(w)$ of W is $\frac{1}{2}f_Y(w)$ from the linear change of variable principle; see e.g. page 333. We now apply the general convolution result page 372 or page 386 for the variables X and W to get

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z) = \int_x \frac{1}{x} f\left(x, \frac{z}{x}\right) dx$$

Question b) This part follows more or less directly from page 372, such that $Z = X - Y$ has density

$$f_Z(z) = \int_x f(x, x - z) dx$$

Question c) Introduce $W = 2Y$. The density $f_W(w)$ of W is $\frac{1}{2}f_Y(w)$ from the linear change of variable principle; see e.g. page 333. We now apply the general convolution result page 372 or page 386 for the variables X and W to get

$$f_Z(z)$$

Question a) We apply the method used to derive the distribution of ratios page 382. Such that

$$P(z < Z < z + dz) = \int_x P(x < X < x + dx, z < XY < z + dz)$$

Instead of the cone on page 382 we now have an area between the two curves $xy = z$ and $xy = z + dz$. Thus we have that the area of the parallelogram for fixed x is approximately equal to

$$dx \left(\frac{z + dz}{x} - \frac{z}{x} \right) = \frac{dx dz}{x}$$

We get the density of Z by integration over x . Thus

$$f_Z(z) = \int_x \frac{1}{x} f \left(x, \frac{z}{x} \right) dx$$

Question b) This part follows more or less directly from page 372, such that $Z = X - Y$ has density

$$f_Z(z) = \int_x f(x, x - z) dx$$

Question c) Introduce $W = 2Y$. The density $f_W(w)$ of W is $\frac{1}{2}f_Y(w)$ from the linear change of variable principle; see e.g. page 333. We now apply the general convolution result page 372 or page 386 for the variables X and W to get

$$f_Z(z) = \int_x \frac{1}{2} f \left(x, \frac{z - x}{2} \right) dx$$