Problems 1 and 2

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Intro to Problems 1 and 2

EDIT

Problems 1 and 2 assess your knowledge/ability in computing probabilities related to the normal (Gaussian, Z) distribution. Like much of the work in BEM1105x, you are free to work out your answers using computational software (e.g., Excel). If you don't have access to statistical software, you can also use online statistical calculators, e.g., http://stattrek.com/online-calculator/normal.aspx

Problems 1 and 2

EDIT

Problems 1 and 2

0.0/20.0 points (ungraded)

Let X be a normal random variable with mean equal to one and variance equal to four. Using statistical software if needed, answer the following two questions:

Enter the probability that X is no more than one, $P(X \leq 1)$:

Enter the probability that X is no less than minus two, $P(X \geq -2)$:

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Problem 3

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Intro to Problem 3

EDIT

Problems 3 assesses your knowledge/ability in computing probabilities related to functions of the standard normal random variable.

Problem 3

EDIT

Problem 3

0.0/10.0 points (ungraded)

Let $N(x) = P(Z \leq x)$ denote the probability that a standard normal random variable Z is no more than x. Consider the probability

$$P\left(ae^{bZ+c} \geq d\right).$$

Here, a, b, c, d are positive constants and e^x is the exponential function.

What is the expression for that probability in terms of function $N(x)$?

- $N\left(\frac{\log(d)-\log(a)-c}{b}\right)$
- $N\left(\frac{c-\log(d)+\log(a)}{b}\right)$
- $N\left(\frac{d}{a}\right)$
- $N\left(\log(d) - a\exp bZ + c\right)$

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Problem 4

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Intro to Problem 4

EDIT

Problem 4 assesses your knowledge/skills in computing integrals with respect to the density of normal random variables.

Problem 4

EDIT

Problem 4

0.0/10.0 points (ungraded)

Consider the function

$$f(x) = e^{-\frac{1}{2}(x-m)^2}.$$

Knowing that the integral of $cf(x)$ from minus infinity to plus infinity is equal to one for an appropriate constant c, what is the coresponding integral of $cxf(x)$ equal to?

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Problem 5

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Intro to Problem 5

EDIT

Problem 5 assesses your knowledge/skills in solving the simplest linear ordinary differential equation (ODE).

Problem 5

EDIT

Problem 5

0.0/10.0 points (ungraded)

Let $f(t)$ be the solution to the ordinary differential equation

$$f'(t) = 2f(t),$$

with the boundary condition $f(0) = 3$.

Enter the numerical value value of $f(1)$:

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Problems 6 and 7

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Intro to Problems 6 and 7

EDIT

Problem 6 assesses your knowledge/skills in computing partial derivatives of a function (a topic that belongs to multivariate calculus).

Problems 6 and 7

EDIT

Problems 6 and 7

0.0/20.0 points (ungraded)

Consider the function

$$f(x,y) = x^2y^3$$

.

Enter the value of its derivative with respect to y at the point $(x = 2, y = 3)$:

Enter the value of its second partial derivative with respect to x and y at the point $(x = 2, y = 3)$:

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Problems 8 and 9

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Intro to Problems 8 and 9

EDIT

Problems 8 and 9 assess your knowledge/skills in computing the expected value and the variance of discrete random variables.

Problems 8 and 9

EDIT

Problems 8 and 9

0.0/20.0 points (ungraded)

Let X be a random variable that takes values 0, 1 and 2 with probabilities 1/4, 1/4 and 1/2, respectively.

Enter the numerical value for the expected value of X, $E[X]$:

Enter the numerical value for the variance of X, $Var(X)$:

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Intro to Problem 10

EDIT

Problem 10 assess your knowledge/skills in computing the total (or full) derivative of a function with respect to a given variable. (This is probably the hardest problem of the ten.)

Problem 10

EDIT

Problem 10

0.0/10.0 points (ungraded)

Let $y(x)$ be a function of x, and $f(x,y)$ a function of two variables. Denote the derivative of $y(x)$ with respect to x by y_x, the derivative of f with respect to the first variable, and evaluated at the point $(x,y(x))$, by f_x, and the derivative of f with respect to the second variable, and evaluated at the point $(x,y(x))$,by f_y.

Write, in terms of only y_x, f_x and f_y, the (total) derivative of the function $g(x)=f(x,y(x))$ with respect to x. Explicitly indicate multiplication with a "*" symbol, and write the derivatives as y_x,f_x,f_y.

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