# Calculus and Probability
# Assignment 4

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## Exercise 6

a) ... Answer 6a

b) ... Answer 6b

## Exercise 7

a) i $\frac{\partial}{\partial x} f(x,y) = -\sin(4y - xy)(-y) = y\sin(4y - xy)$

ii $\frac{\partial}{\partial y} f(x,y) = -\sin(4y - xy)(4 - x)$

b) i $\frac{\partial}{\partial x} f(x,y) = \frac{e^{\frac{x}{y}}}{y}$

ii $\frac{\partial}{\partial y} f(x,y) = -\frac{xe^{\frac{x}{y}}}{y^2}$

## Exercise 8

a)

$$\begin{aligned}\int_1^3 (3\sqrt{x} + \frac{3}{x^2})dx &= 3\Big(\int_1^2 \sqrt{x}dx + \int_1^2 \frac{1}{x^2}dx\Big) \\ &= 3\Big(\frac{2}{3}(2\sqrt{2} - 1) + \frac{1}{2}\Big) \\ &= 4\sqrt{2} - \frac{1}{2}\end{aligned}$$

$$\int_1^3 (3\sqrt{x} + \frac{3}{x^2})dx = 4\sqrt{2} - \frac{1}{2}$$

b)

$$\begin{aligned}\int_{-1}^{1} \frac{-5}{\sqrt{1-x^2}}dx &= -5\Big(\int_{-1}^{1} \frac{1}{\sqrt{1-x^2}}dx\Big)\\ &= -5\Big[\arcsin(x)\Big]_{-1}^{1}\\ &= -5\Big[\arcsin(1)-\arcsin(-1)\Big]\\ &= -5\Big[\frac{\pi}{2}-(-\frac{\pi}{2})\Big]\\ &= -5\frac{2\pi}{2}\\ &= -5\pi\end{aligned}$$

$$\int_{-1}^{1} \frac{-5}{\sqrt{1-x^2}}dx = -5\pi$$

## Exercise 9

a)

$$\begin{aligned}\int_{-\infty}^{\frac{-\pi}{2}} \frac{x\cos(x)-\sin(x)}{x^2}dx &= \lim_{b\to\infty}\Big(\Big[\frac{\sin((x)}{x}\Big]_{-b}^{\frac{-\pi}{2}}\Big)\\ &= \lim_{b\to\infty}\Big(\frac{-1}{\frac{-\pi}{2}}-\frac{\sin(b)}{b}\Big)\\ &= \frac{2}{\pi}\end{aligned}$$

$$\int_{-\infty}^{\frac{-\pi}{2}} \frac{x\cos(x)-\sin(x)}{x^2}dx = \frac{2}{\pi}$$

b) ... Answer 9b

## Exercise 10

a) ... Answer 10a

b) ... Answer 10b

## Answer Form Assignment 4

| | |
|---|---|
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| **Question** | **Answer** |
|---|---|
| 6a (1pt) | Answer 6a |
| 6b (1pt) | Answer 6b |
| 7a (1pt) | i $\frac{\partial}{\partial x} f(x,y) = -\sin(4y - xy)(-y) = y\sin(4y - xy)$<br>ii $\frac{\partial}{\partial y} f(x,y) = -\sin(4y - xy)(4 - x)$ |
| 7b (1pt) | i $\frac{\partial}{\partial x} f(x,y) = \frac{e^{\frac{x}{y}}}{y}$<br>ii $\frac{\partial}{\partial y} f(x,y) = -\frac{xe^{\frac{x}{y}}}{y^2}$ |
| 8a (1pt) | $\int_1^3 (3\sqrt{x} + \frac{3}{x^2})dx = 4\sqrt{2} - \frac{1}{2}$ |
| 8b (1pt) | $\int_{-1}^{1} \frac{-5}{\sqrt{1-x^2}}dx = -5\pi$ |
| 9a (1pt) | $\int_{-\infty}^{\frac{-\pi}{2}} \frac{x\cos(x) - \sin(x)}{x^2}dx = \frac{2}{\pi}$ |
| 9b (1pt) | Answer 9b |
| 10a (1pt) | Answer 10a |
| 10b (1pt) | Answer 10b |