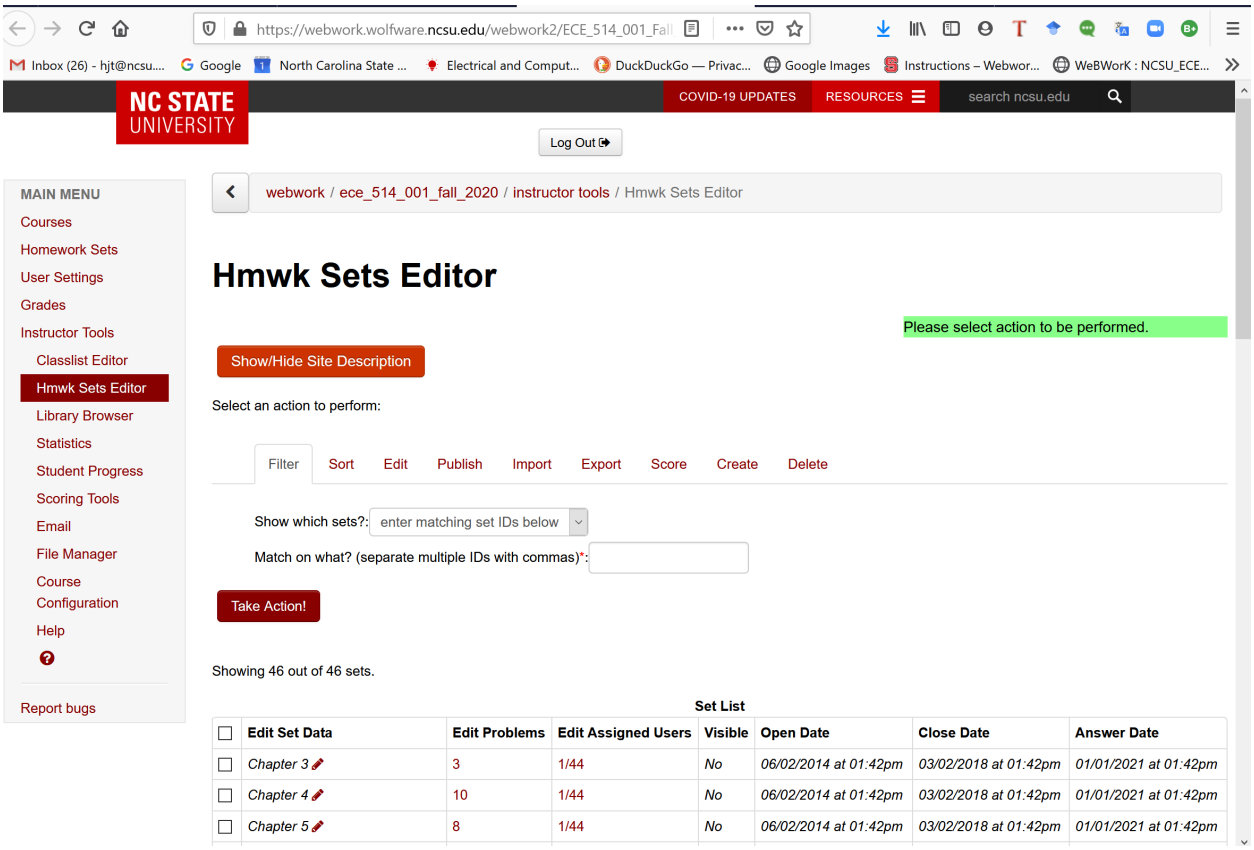
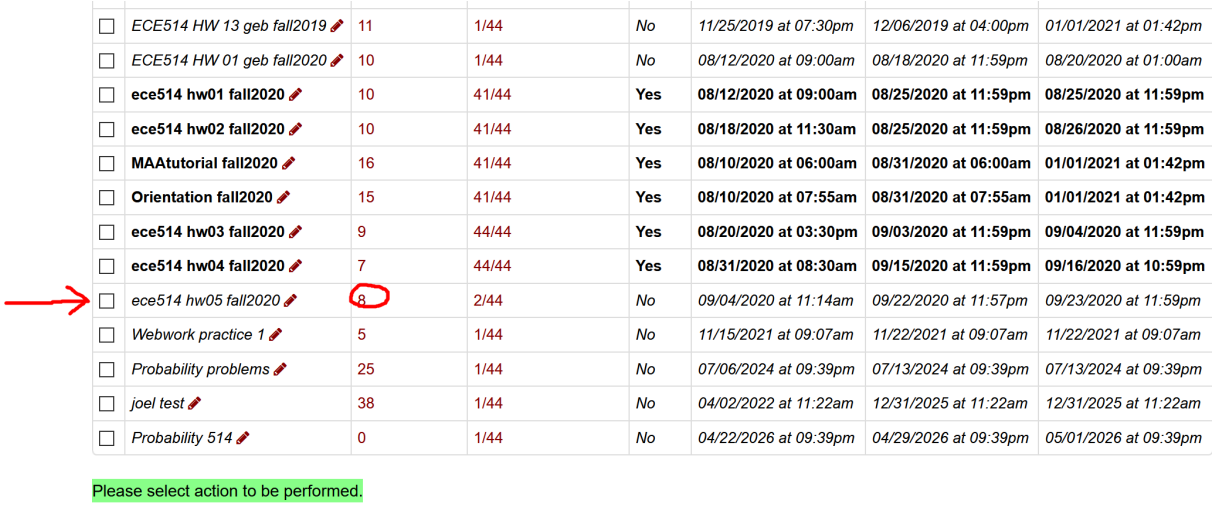
Minor edits to Webwork problems

It is often required to update or correct minor errors in previously used Webwork problems. This will give a couple of examples to show how this can be done by instructors or TAs who use Webwork and have professor permissions.

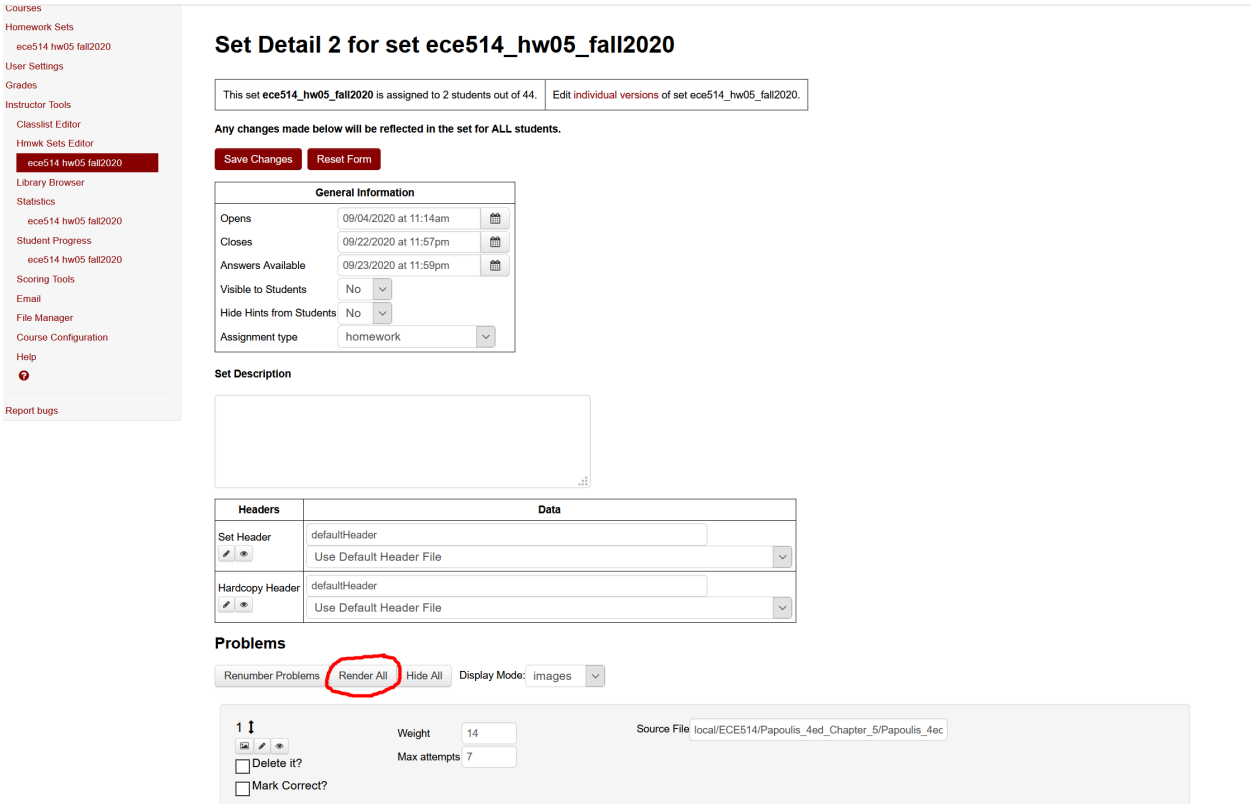
Get to the Webwork Hmwk Sets Editor page either via Moodle or direct access if you the instructor. The page should looks like



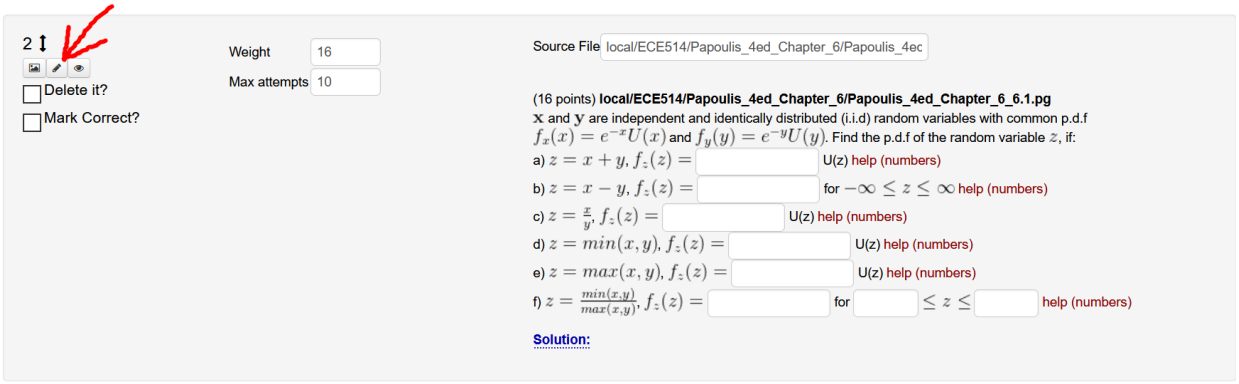
In the problem sets list, click (or right click and select open in new tab) on the number in the Edit Problems column of the Problem set you wish to edit. In this case, ece514_hw05_fall2020



This takes you to the details for the problem set page.



I recommend rendering all the problems so you can see the actual problems in the set, not just the source file name. In any case, the next step to go to the problem editor. In the problem of interest, click on the "edit" icon (again, I prefer to use right click and select open in new tab)



In this case, we want to edit the solution. Clicking on the "Solution:" link, expands the solution.

2

Delete it?

Mark Correct?

Weight 16

Max attempts 10

Source File local/ECE514/Papoulis_4ed_Chapter_6/Papoulis_4ec

(16 points) **local/ECE514/Papoulis_4ed_Chapter_6/Papoulis_4ed_Chapter_6_6.1.pg**

$\mathbf{x}$ and $\mathbf{y}$ are independent and identically distributed (i.i.d) random variables with common p.d.f $f_x(x) = e^{-x}U(x)$ and $f_y(y) = e^{-y}U(y)$. Find the p.d.f of the random variable z, if:

a) $z = x + y$, $f_z(z) =$ U(z) help (numbers)

b) $z = x - y$, $f_z(z) =$ for $-\infty \leq z \leq \infty$ help (numbers)

c) $z = \frac{x}{y}$, $f_z(z) =$ U(z) help (numbers)

d) $z = min(x, y)$, $f_z(z) =$ U(z) help (numbers)

e) $z = max(x, y)$, $f_z(z) =$ U(z) help (numbers)

f) $z = \frac{min(x,y)}{max(x,y)}$, $f_z(z) =$ for $\leq z \leq$ help (numbers)

Solution:

(Instructor solution preview: show the student solution after due date.)

SOLUTION

a) Define $z = x + y$. We know the pdf of the sum of two random variables is the convoluton of the pdfs of the random variables:

$$f_z(z) = \int_{-\infty}^{\infty} f_x(z-y)f_y(y)dy = \int_{-\infty}^{\infty} e^{-(z-y)}U(z-y)e^{-(y)}U(y)dy$$

We note that = $U(z - y) = 0$ for $z < y$ and $U(y) = 0$ for $y < 0$., this means the limits of integration on y are $[0, z]$

so, for $z \geq 0$, we have $f_z(z) = \int_0^z e^{-z}dy = ze^{-z}$

and for $z < 0$, we have $f_z(z) = 0$

or $f_z(z) = ze^{-z}U(z)$

b) $z = x - y$

z ranges over entire real axis for RV's x and y. For equation 6.55 in textbook, we have:

$F_z(z) = \int_0^{\infty} \int_0^{z+y} f_{xy}(x, y)dxdy$, for $z \geq 0$ and $F_z(z) = \int_{-z}^{\infty} \int_0^{z+y} f_{xy}(x, y)dxdy$, for $z < 0$

Differentiation gives: $f_z(z) = \int_0^{\infty} f_{xy}(z + y, y)dy$, for $z \geq 0$ and

$f_z(z) = \int_{-z}^{\infty} f_{xy}(z + y, y)dy$, for $z < 0$

$f_z(z) = \int_0^{\infty} e^{-(z+y+y)}dy$, for $z \geq 0$ and $f_z(z) = \int_{-z}^{\infty} e^{-(z-y+y)}dy$, for $z < 0$

$f_z(z) = \frac{1}{2}e^{-z}$, for $z \geq 0$ and $f_z(z) = \frac{1}{2}e^{z}$, for $z < 0$

Thus $f_z(z) = \frac{1}{2}e^{-|z|}$, for $-\infty < z < \infty$.

c) $z = x/y$

$F_z(z) = P(z < z) = P(x/y < z) = P(x < yz)$ for $z \geq 0$

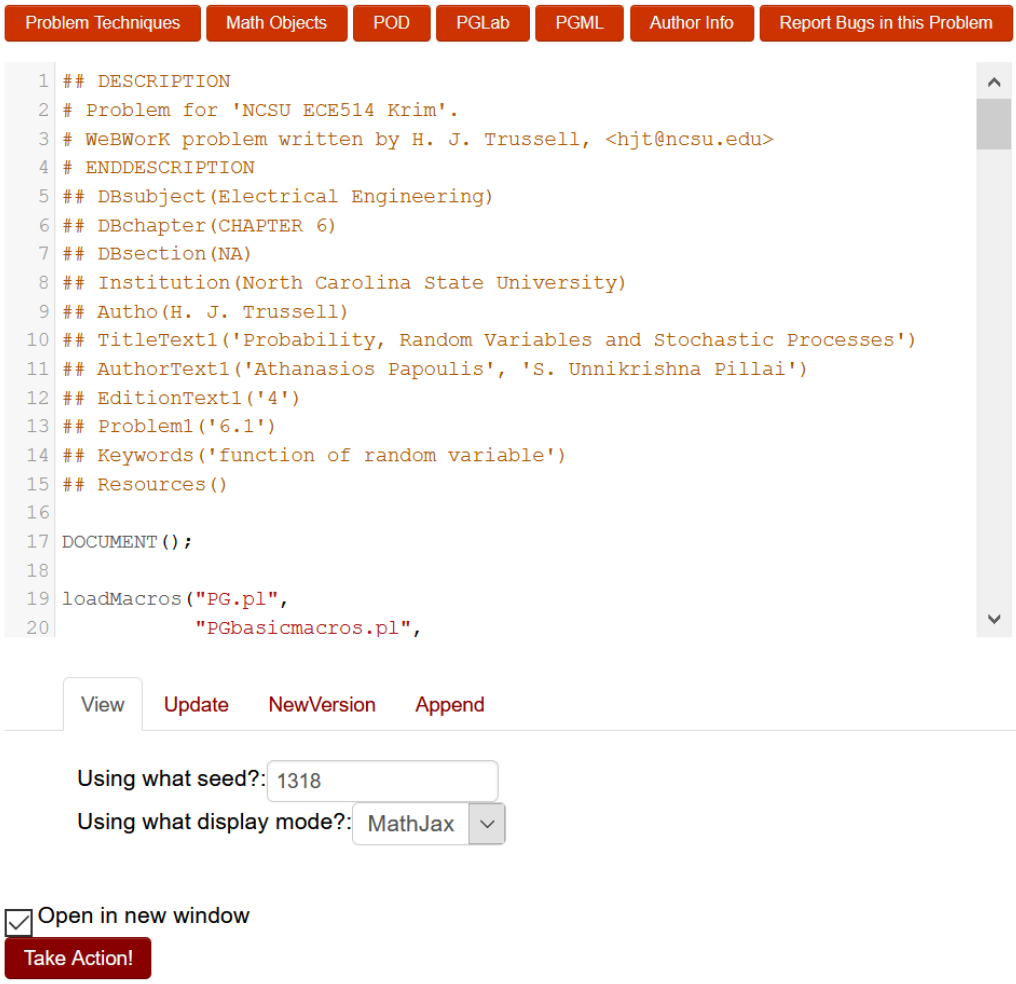
This defines the region in the x-y plane described by

Now, click the edit icon, this takes you to the edit page

webwork / ece_514_001_fall_2020 / ece514_hw05_fall2020 / 2 / Editor

Problem 2

Editing ***set ece514_hw05_fall2020/problem 2*** *in file '[TMPL]/local/ECE514/Papoulis_4ed_Chapter_6/Papoulis_4ed_Chapter_6_6.1.pg'*



We need to change in the problem solution, "sum of two random variables" should be "sum of two independent random variables"

Scroll down to the Solution and type in the word “independent” in the proper place.

Problem 2

Editing ***set ece514_hw05_fall2020/problem 2*** *in file '[TMPL]/local/ECE514/Papoulis_4ed_Chapter_6/Papoulis_4ed_Chapter_*

Problem Techniques | Math Objects | POD | PGLab | PGML | Author Info | Report Bugs in this Problem

```
76 ##############################
77 # Solution
78
79 Context()->texStrings;
80 BEGIN_SOLUTION;
81 $PAR
82 $BBOLD  SOLUTION $EBOLD
83 $PAR
84 a) Define \( z = x + y \). We know the pdf of the sum of two independent
   random variables is the convoluton of the pdfs of the random variables: $BR
85 \( f_z(z) = \int_{-\infty}^{\infty} f_{x}(z-y)f_y(y) dy = \int_{-
   \infty}^{\infty} e^{-(z-y)}U(z-y)e^{-(y)}U(y)dy \)$PAR
86 We note that = \(U(z-y) = 0\) for \( z < y\) and \( U(y) = 0\) for \(y <
   0.\), this means the limits of integration on \(y\) are \([0,z]\)$BR
87 so, for \(z \geq 0\), we have \( f_z(z) = \int_{0}^{z} e^{-z} dy = ze^{-z}
   \)$BR
88 and for \(z < 0\), we have \( f_z(z) = 0 \) $PAR
89 or \( f_z(z) = ze^{-z}U(z) \) $PAR
90
91 b) \( z = x - y \) $BR
```

View | Update | NewVersion | Append

The next edit in part c is to capitalize Z in subscript of F (F_Z(z)) and in P(Z <=z), also, would like to change all < signs to < or = signs

So scroll down to the proper place and make changes by simple delete and retype, or typing over selections

Original perl code

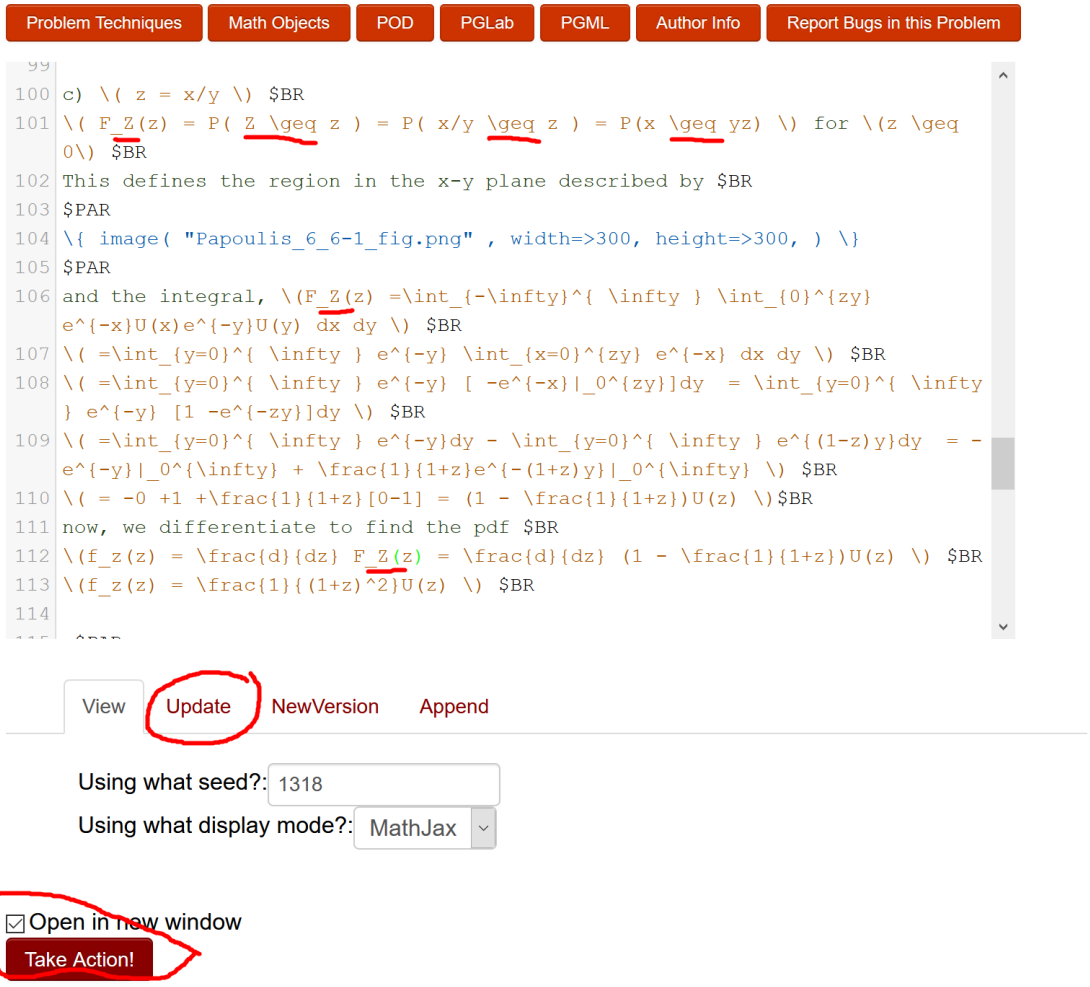
Problem 2

Editing ***set ece514_hw05_fall2020/problem 2*** *in file '[TMPL]/local/ECE514/Papoulis_4ed_Chapter_6/Papoulis_4ed_Chapter_6_6.1.pg'*

Problem Techniques | Math Objects | POD | PGLab | PGML | Author Info | Report Bugs in this Problem

```
99
100 c) \( z = x/y \) $BR
101 \( F_z(z) = P( z < z ) = P( x/y < z ) = P(x < yz) \) for \(z \geq 0\) $BR
102 This defines the region in the x-y plane described by $BR
103 $PAR
104 \{ image( "Papoulis_6_6-1_fig.png" , width=>300, height=>300, ) \}
105 $PAR
106 and the integral, \(F_z(z) =\int_{-\infty}^{ \infty } \int_{0}^{zy}
    e^{-x}U(x)e^{-y}U(y) dx dy \) $BR
107 \( =\int_{y=0}^{ \infty } e^{-y} \int_{x=0}^{zy} e^{-x} dx dy \) $BR
108 \( =\int_{y=0}^{ \infty } e^{-y} [ -e^{-x}|_0^{zy}]dy  = \int_{y=0}^{ \infty
    } e^{-y} [1 -e^{-zy}]dy \) $BR
109 \( =\int_{y=0}^{ \infty } e^{-y}dy - \int_{y=0}^{ \infty } e^{(1-z)y}dy  = -
    e^{-y}|_0^{\infty} + \frac{1}{1+z}e^{-(1+z)y}|_0^{\infty} \) $BR
110 \( = -0 +1 +\frac{1}{1+z}[0-1] = (1 - \frac{1}{1+z})U(z) \)$BR
111 now, we differentiate to find the pdf $BR
112 \(f_z(z) = \frac{d}{dz} F_z(z) = \frac{d}{dz} (1 - \frac{1}{1+z})U(z) \) $BR
113 \(f_z(z) = \frac{1}{(1+z)^2}U(z) \) $BR
114
115  $PAR
```

Edited Perl code



We are ready to save the edits. Click on the “Update” tab and then click “Take Action”

This will display the updated problem in a new tab. Since the edits were in the solution, we need to click on “Solution:” to expose the edited solution

c) $z = \frac{x}{y}$, $f_z(z) =$ [ ] U(z) help (numbers)

d) $z = min(x, y)$, $f_z(z) =$ [ ] U(z) help (numbers)

e) $z = max(x, y)$, $f_z(z) =$ [ ] U(z) help (numbers)

f) $z = \frac{min(x,y)}{max(x,y)}$, $f_z(z) =$ [ ] for [ ] $\leq z \leq$ [ ] help (numbers)

Solution:

(Instructor solution preview: show the student solution after due date.)

SOLUTION

a) Define $z = x + y$. We know the pdf of the sum of two independent random variables is the convoluton of the pdfs of the random variables:

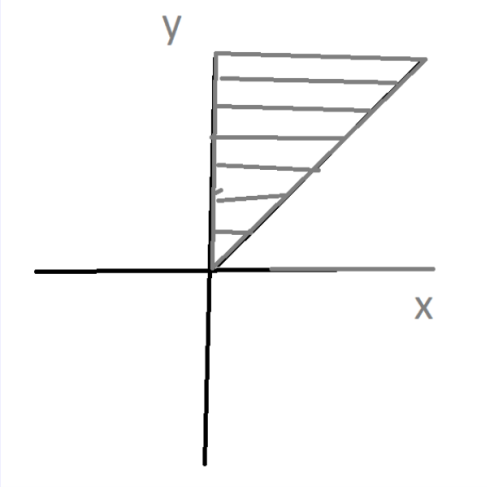
$f_z(z) = \int_{-\infty}^{\infty} f_x(z-y) f_y(y) dy = \int_{-\infty}^{\infty} e^{-(z-y)} U(z-y) e^{-(y)} U(y) dy$

We note that = $U(z-y) = 0$ for $z < y$ and $U(y) = 0$ for $y < 0$., this means the limits of integration on y are $[0, z]$
so, for $z \geq 0$, we have $f_z(z) = \int_0^z e^{-z} dy = z e^{-z}$
and for $z < 0$, we have $f_z(z) = 0$

or $f_z(z) = z e^{-z} U(z)$

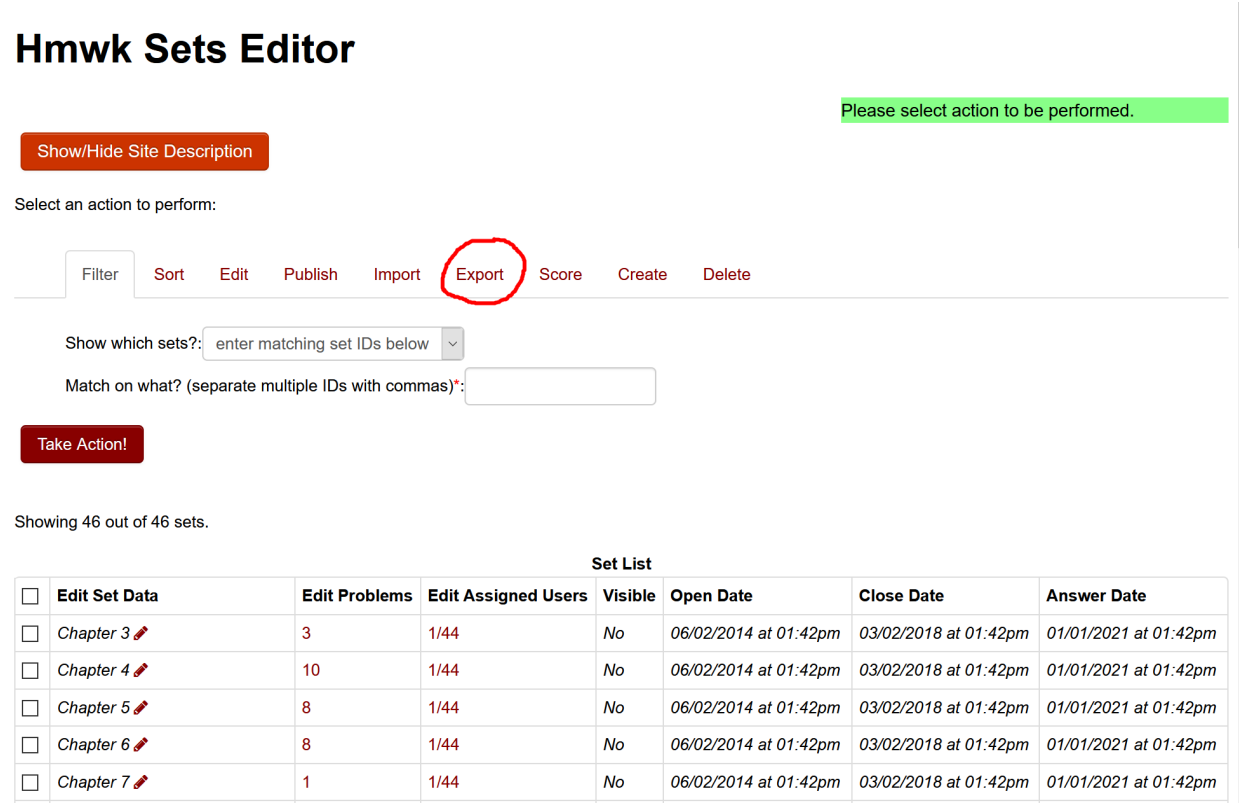
And

c) $z = x/y$
$F_Z(z) = P(Z \geq z) = P(x/y \geq z) = P(x \geq yz)$ for $z \geq 0$
This defines the region in the x-y plane described by



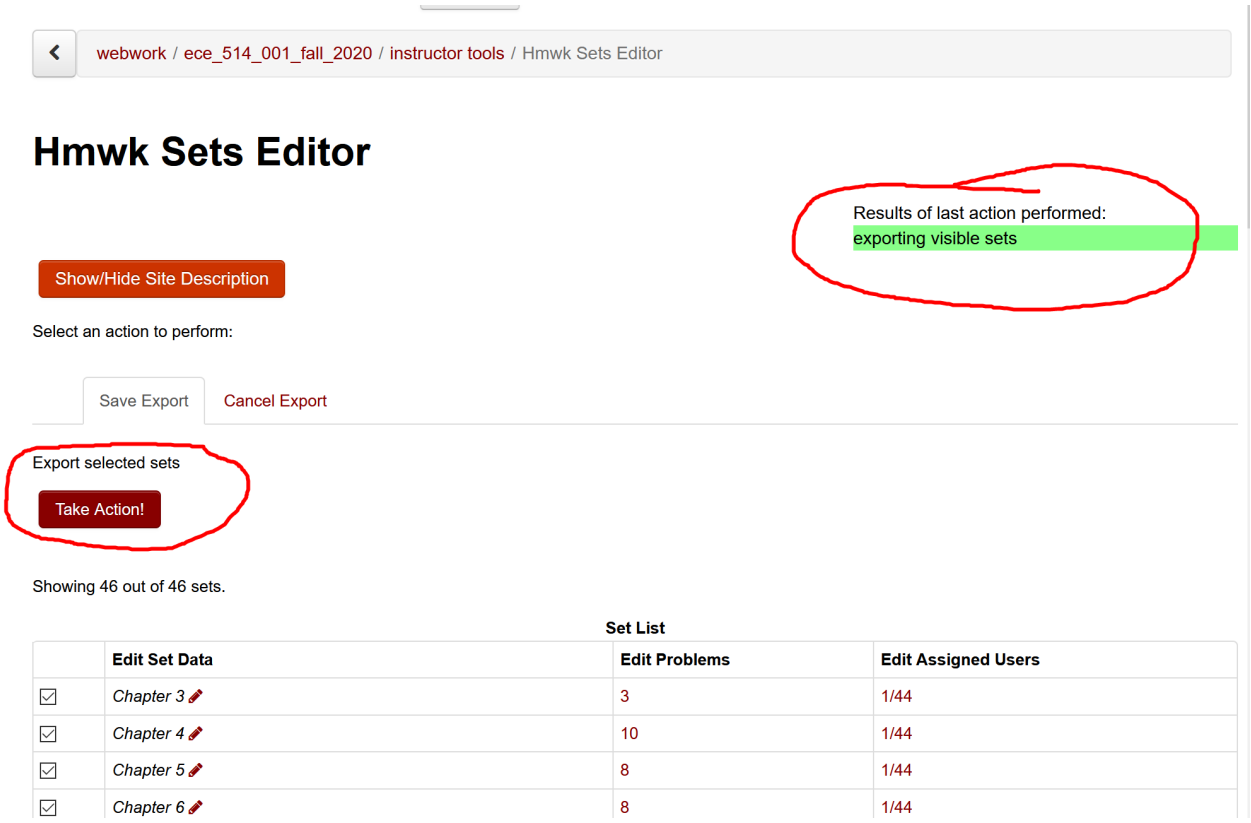
and the integral, $F_Z(z) = \int_{-\infty}^{\infty} \int_0^{zy} e^{-x} U(x) e^{-y} U(y) dx dy$
$= \int_{y=0}^{\infty} e^{-y} \int_{x=0}^{zy} e^{-x} dx dy$
$= \int_{y=0}^{\infty} e^{-y} [-e^{-x}|_0^{zy}] dy = \int_{y=0}^{\infty} e^{-y} [1 - e^{-zy}] dy$
$= \int_{y=0}^{\infty} e^{-y} dy - \int_{y=0}^{\infty} e^{(1-z)y} dy = -e^{-y}|_0^{\infty} + \frac{1}{1+z} e^{-(1+z)y}|_0^{\infty}$
$= -0 + 1 + \frac{1}{1+z}[0 - 1] = (1 - \frac{1}{1+z}) U(z)$
now, we differentiate to find the pdf
$f_z(z) = \frac{d}{dz} F_Z(z) = \frac{d}{dz}(1 - \frac{1}{1+z}) U(z)$
$f_z(z) = \frac{1}{(1+z)^2} U(z)$

The problem is now ready for the students. However, there is one more step that needs to be done to save to the new file to Webwork archives. Go back to the Webwork Hmwk Sets Editor page and click the “Export” tab.



	Edit Set Data	Edit Problems	Edit Assigned Users	Visible	Open Date	Close Date	Answer Date
☐	*Chapter 3*	3	1/44	*No*	*06/02/2014 at 01:42pm*	*03/02/2018 at 01:42pm*	*01/01/2021 at 01:42pm*
☐	*Chapter 4*	10	1/44	*No*	*06/02/2014 at 01:42pm*	*03/02/2018 at 01:42pm*	*01/01/2021 at 01:42pm*
☐	*Chapter 5*	8	1/44	*No*	*06/02/2014 at 01:42pm*	*03/02/2018 at 01:42pm*	*01/01/2021 at 01:42pm*
☐	*Chapter 6*	8	1/44	*No*	*06/02/2014 at 01:42pm*	*03/02/2018 at 01:42pm*	*01/01/2021 at 01:42pm*
☐	*Chapter 7*	1	1/44	*No*	*06/02/2014 at 01:42pm*	*03/02/2018 at 01:42pm*	*01/01/2021 at 01:42pm*

Verify that Export which sets? Is set to visible sets. Than click “take action.” This will show that Webwork is setting to export visible sets – note the green line



You need to click “Take Action” one more time to complete the export operation! This updates the *.def files in the Webwork archive. Do not omit this action! You may lose your edits, not for this semester but for the next semester, if you create a new archive without completing the export. This gives

Hmwk Sets Editor

Results of last action performed:
46 sets exported, 0 sets skipped. Skipped sets:
()

Show/Hide Site Description

Select an action to perform:

Filter | Sort | Edit | Publish | Import | Export | Score | Create | Delete

Show which sets?: enter matching set IDs below

Match on what? (separate multiple IDs with commas)*:

Take Action!

Showing 46 out of 46 sets.

Set List

	Edit Set Data	Edit Problems	Edit Assigned Users	Visible	Open Date	Close Date	Answer Date
☑	*Chapter 3*	3	1/44	*No*	*06/02/2014 at 01:42pm*	*03/02/2018 at 01:42pm*	*01/01/2021 at 01:42pm*