This exam runs from 8:00 to 9:20; if I've written it well, then you shouldn't need the whole time. You may use one sheet of notes that you've written yourself, but not your textbook or anything else not written by you, and you may not communicate with anybody but me. You can come up and talk to me if you have questions, especially about the instructions. Also, you may use a calculator if you wish, although you shouldn't need one.

Take your time, and check over your answers. Read the instructions carefully, and be sure to show everything that they ask. You can always show *more* work if you like; for instance, you may draw a graph if you find it helpful, even when a problem does not require you to draw a graph. If you're unsure of your answer, then explain what you're unsure about, and show your work so that you can get as much partial credit as possible.

Don't forget to put your name on the exam!!!

1

a *Compare the order of the numbers $5-3$ and $3-5$; that is, write the correct symbol ('<', '>', or '=') between them.*

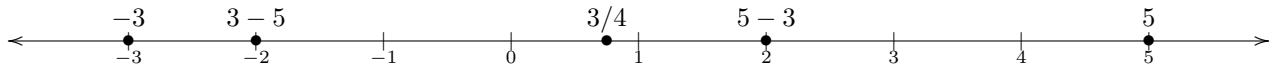
Since $5-3=2$, $3-5=-2$, and $2>-2$,

$$5-3>3-5.$$

b *Of the numbers -3, 5, and $3/4$, which are integers?*

The numbers -3 and 5 are integers, but $3/4$ is not. (However, $3/4$ is at least a rational number; on the other hand, 5 is also a whole number and in fact a natural number.)

c *Draw a number line and mark $5-3$, $3-5$, -3, 5, and $3/4$ on it.*



2 *Evaluate and simplify the following expressions. Show at least one intermediate step for each. (Merely writing down the answer that your calculator gives you is worth no credit!)*

a $8-6-(-6)$

$$8-6-(-6)=2+6=8.$$

b $\dfrac{2}{3}-\dfrac{4}{5}$

$$\frac{2}{3}-\frac{4}{5}=\frac{10}{15}-\frac{12}{15}=-\frac{2}{15}.$$

c $5-2(11-3^2)$

$$5-2(11-3^2)=5-2(11-9)=5-2(2)=5-4=1.$$

d $-|3-5|$

$$-|3-5|=-|-2|=-2.$$

e $\dfrac{8 \times 10^5}{4 \times 10^3}$ *(in scientific notation)*

$$\frac{8 \times 10^5}{4 \times 10^3} = \frac{8}{4} \times 10^{5-3} = 2 \times 10^2.$$

f $4x^2 + 5$ *when* $x = -2$

When $x = -2$,

$$4x^2 + 5 = 4(-2)^2 + 5 = 4(4) + 5 = 16 + 5 = 21.$$

3 *Simplify the following algebraic expressions and write them in standard form. Show* at least *one intermediate step for each.*

a $(3x - 6) - (4x + 2)$

$$(3x - 6) - (4x + 2) = 3x - 6 - 4x - 2 = -x - 8.$$

b $5y - 4(6y - 8)$

$$5y - 4(6y - 8) = 5y - 24y + 32 = -19y + 32.$$

c $(3xy^{-3})^{-2}$

$$(3xy^{-3})^{-2} = 3^{-2}x^{-2}(y^{-3})^{-2} = \frac{1}{9}x^{-2}y^6.$$

You could also write the answer as

$$\frac{y^6}{9x^2}.$$

d $(2xy^3)(3x^3y^5)$

$$(2xy^3)(3x^3y^5) = (2 \cdot 3)x^{1+3}y^{3+5} = 6x^4y^8.$$

e $-y^4(7y^2 + 2y - 3)$

$$-y^4(7y^2 + 2y - 3) = -y^4(7y^2) - y^4(2y) - y^4(-3) = -7y^6 - 2y^5 + 3y^4.$$

f $(t - 1)(t^2 - 4t + 5)$

$$(t - 1)(t^2 - 4t + 5) = t^3 - 4t^2 + 5t - t^2 + 4t - 5 = t^3 - 5t^2 + 9t - 5.$$

4 *In these problems, show what numerical calculation you make, and be sure to include the* correct units *in your answer.*

a *Suppose that you have \$100 in a checking account. If you deposit a check for \$40 and write two checks for \$30 each, then how much money will be in your account?*

Since

$$100 + 40 - 2(30) = 80,$$

I'll have 80 **dollars** in my account.

b **Extra credit:** *If a right prism has height h and its base has area A and perimeter p, then its surface area is given by*

$$2A + ph.$$

Suppose that you have a right prism with a height of 4 metres and its base has an area of 4 square metres and a perimeter of 8 metres. What is its surface area?

Since

$$2(4) + (8)(4) = 8 + 32 = 40,$$

the surface area is 40 **square metres**. Alternatively, using $A = 4\,\mathrm{m}^2$, $p = 8\,\mathrm{m}$, and $p = 8\,\mathrm{m}$, the surface area is

$$2(4\,\mathrm{m}^2) + (8\,\mathrm{m})(4\,\mathrm{m}) = 8\,\mathrm{m}^2 + 32\,\mathrm{m}^2 = 40\,\mathrm{m}^2.$$