Name: _____ Mark: _____

Algebra (evaluating expressions)

To evaluate an algebraic expression, we simply substitute the given values of variables in for those variables:

Example 1. Evaluate $4x + 6y$ for $x = 2$ and $y = 5$.

$$4(2) + 6(5) = 8 + 30 = 38$$

Be careful about order of operations! I recommend you take a moment to replace all of the variables first (with parentheses as necessary), then move forward with order of operations.

Example 2. Evaluate $3 + 2n^2$ for $n = 3$.

$$3 + 2(3)^2 = 3 + 2(9) = 3 + 18 = 21$$

NOT

$$3 + 2(3)^2 = 3 + 6^2 = 3 + 36 = 39$$

Evaluating expressions becomes an excellent way to test if a simplification of an algebraic expression is incorrect.

Example 3. Simplify $20 - 3(x + 1)$.

If we believe $20 - 3(x + 1) = 20 - 3x + 3 = 23 - 3x$, we can try $x = 1$ and see that the original expression gives

$$20 - 3(1 + 1) = 20 - 3(2) = 20 - 6 = 14$$

but our believed answer gives

$$23 - 3(1) = 23 - 3 = 20 \neq 14$$

so we know something is wrong.

Note that evaluation can only tell you if an expression is incorrect; it cannot tell you if an expression is correct.

1. Find the value of the following expressions when $t = 3$:

   (a) (1 point)

   $$6t + 3$$

   (b) (1 point)

   $$6t - 3t^2$$

   (c) (1 point)

   $$(4t + 1)^2 - 3(2t - 1)$$

2. Find the value of the following expressions when $u = -2$:

   (a) (1 point)

   $$7 - 2u$$

   (b) (1 point)

   $$(u + 4)(u - 1) - 3u^2$$

3. Find the value of the following expressions when $x = 2$:

   (a) (1 point)

   $$3x + 7$$

   (b) (1 point)

   $$x^2 - 5x + 6$$

   (c) (1 point)

   $$2(x - 4)^2$$

4. Find the value of the following expressions when $a = -1$:

   (a) (1 point)

   $$a^2 + 3a - 4$$

   (b) (1 point)

   $$5 - 2a^3$$

5. Find the value of the following expressions when $y = 4$:

   (a) (1 point)

   $$(y + 3)(y - 2) - y^2$$

   (b) (1 point)

   $$\frac{y^3 - 8y}{y - 2}$$

   (c) (1 point)

   $$\sqrt{y^2 + 9} + (y - 1)^2$$

6. Find the value of the following expressions when $z = -3$:

   (a) (1 point)

   $$|z| - z^2 + 2z$$

   (b) (1 point)

   $$\frac{2z + 1}{z - 1} + (z + 2)^2$$

7. Find the value of the following expressions when $p = 4$ and $q = -2$:

   (a) (1 point)

   $$3p - 2q$$

   (b) (1 point)

   $$(p + q)(p - q)$$

   (c) (1 point)

   $$\frac{p^2 - q^2}{p + q + 1}$$

8. Find the value of the following expressions when $m = 3$ and $n = 5$:

   (a) (1 point)

   $$(m - n)^2 - (m + n)^2$$

   (b) (1 point)

   $$\frac{2m^2n - mn^2}{m + 2}$$

9. Find the value of the following expressions when $a = 4$ and $b = -1$:

   (a) (1 point)

$$(a-b)^2 + (a+b)^2$$

   (b) (1 point)

$$\frac{a^2 - b^2}{a - b - 2} - ab$$

   (c) (2 points)

$$(a+b)^3 - 3ab(a+b)$$

10. Find the value of the following expression when $x = 2$ and $y = -3$:

$$\frac{x+y}{x-y} + \frac{x-y}{x+y}$$