

NAME: SOLUTIONS

STUDENT NUMBER: \_\_\_\_\_

## TEST 1

Dawson College

Applied Math (201-943-DW)

Date: SEPTEMBER 28th 2012

Instructor: Emilie Richer

**This test is marked out of 60 marks**

**Question 1.** (10 marks)

Simplify the given expressions. Express the results with positive exponents only.

(a)  $\pi \left(\frac{r}{3}\right)^3 \left(\frac{4}{3\pi r^2}\right)$

$$= \pi \cdot \frac{r^3}{27} \cdot \frac{4}{3\pi r^2} = \frac{4\pi r^3}{81\pi r^2} = \boxed{\frac{4\pi r}{81}}$$

(b)  $\frac{(3^2 t)^{-1}}{3t^{-1}} = \frac{t}{3(3^2 t)} = \boxed{\frac{1}{27}}$

(c)  $\left(\frac{4a^{\frac{5}{6}} b^{-\frac{1}{5}}}{a^{\frac{2}{3}} b^2}\right)^{-\frac{1}{2}} = \frac{4^{-\frac{1}{2}} a^{-\frac{5}{12}} b^{\frac{1}{10}}}{a^{-\frac{1}{3}} b^{-1}}$   
 $= \frac{a^{\frac{1}{3}} b^{\frac{1}{10}} b}{4^{\frac{1}{2}} a^{\frac{5}{12}}} = \frac{a^{-\frac{1}{12}} b^{\frac{11}{10}}}{2} = \boxed{\frac{b^{\frac{11}{10}}}{2a^{\frac{1}{12}}}}$

(d)  $\left(\frac{3^{-1} a^{\frac{1}{2}}}{4^{-\frac{1}{2}} b}\right) \div \left(\frac{9^{\frac{1}{2}} a^{-\frac{1}{3}}}{2b^{-\frac{1}{4}}}\right)$

$$= \frac{4^{\frac{1}{2}} a^{\frac{1}{2}}}{3b} \cdot \frac{2b^{-\frac{1}{4}}}{9^{\frac{1}{2}} a^{-\frac{1}{3}}} \quad \leftarrow \text{multiplication by reciprocal}$$

$$= \frac{2a^{\frac{1}{2}}}{3b} \cdot \frac{2a^{\frac{1}{3}}}{3b^{\frac{1}{4}}}$$

$$= \boxed{\frac{4a^{\frac{5}{6}}}{9b^{\frac{5}{4}}}}$$

**Question 2.** (6 marks)

Simplify the given algebraic expressions.

$$\begin{aligned} & \text{(a) } -(3t - (7 + 2t - (5t - 6))) \\ &= - (3t - (7 + 2t - 5t + 6)) \\ &= - (3t - (-3t + 13)) \\ &= - (6t - 13) \\ &= \boxed{-6t + 13} \end{aligned}$$

$$\begin{aligned} & \text{(b) } 5V^2 - (6 - (2V^2 + 3)) \\ &= 5V^2 - (6 - 2V^2 - 3) \\ &= 5V^2 - (3 - 2V^2) \\ &= \boxed{7V^2 - 3} \end{aligned}$$

**Question 3.** (6 marks)

Perform the indicated multiplications.

$$\begin{aligned} & \text{(a) } -4c^2(-9gc - 2c + g^2) \\ &= \boxed{36c^3g + 8c^3 - 4c^2g^2} \end{aligned}$$

$$\begin{aligned} & \text{(b) } ax(x+4)(7-x^2) \\ &= (ax^2 + 4ax)(7-x^2) \\ &= \boxed{7ax^2 - ax^4 + 28ax - 4ax^3} \end{aligned}$$

**Question 4. (6 marks)**

Perform the indicated divisions.

$$(a) \frac{9(aB)^4 - 6aB^4}{3aB^3} = \frac{9a^4 B^4}{3aB^3} - \frac{6aB^4}{3aB^3}$$

$$= \boxed{3a^3 B - 2B}$$

$$(b) \frac{2x^{n+2} + 4ax^n}{2x^n} = \frac{2x^{n+2}}{2x^n} + \frac{4ax^n}{2x^n}$$

$$= \boxed{x^2 + 2a}$$

**Question 5. (9 marks)**

Solve the given equations

(a)  $3 - 6(2 - 3t) = t - 5$

$3 - 12 + 18t = t - 5$

$17t = 4$

$t = \frac{4}{17}$

(b)  $\frac{4x - 2(x - 4)}{3} = 8$

$4x - 2x + 8 = 24$

$2x = 16$

$x = 8$

(c)  $\frac{42}{R} = \frac{7}{3}$

$126 = 7R$

$R = 126/7 = \boxed{18}$

**Question 6. (6 marks)**

Solve the given quadratic equations by factoring.

$$(a) 10b^2 + 23b = 5$$

$$10b^2 + 23b - 5 = 0$$

$$10b^2 + 25b - 2b - 5 = 0$$

$$5b(2b+5) - (2b+5) = 0$$

$$(2b+5)(5b-1) = 0$$

$$N \cdot M = -50$$

$$N + M = 23$$

$$N = 25$$

$$M = -2$$

$$\text{so } \boxed{b = -\frac{5}{2} \text{ \& } b = \frac{1}{5}}$$

$$(b) x^2 + x - 56 = 0$$

$$(x+8)(x-7) = 0$$

$$\text{so } \boxed{x = -8 \text{ \& } x = 7}$$

**Question 7. (6 marks)**

Solve the given quadratic equations by any appropriate algebraic method.

$$(a) 3x^2 + 8x + 2 = 0$$

$$x = \frac{-8 \pm \sqrt{64 - 4(3)(2)}}{2(3)} = \frac{-8 \pm \sqrt{40}}{6}$$

$$= \frac{-8 \pm 2\sqrt{10}}{6}$$

$$= \boxed{-\frac{4}{3} \pm \frac{1}{3}\sqrt{10}}$$

$$(b) 4v^2 = v + 5$$

$$4v^2 - v - 5 = 0$$

$$4v^2 - 5v + 4v - 5 = 0$$

$$v(4v-5) + 1(4v-5) = 0$$

$$(4v-5)(v+1) = 0$$

$$\boxed{v = \frac{5}{4} \text{ \& } v = -1}$$

**Question 8.** (6 marks)

A car's radiator contains 12L of antifreeze at a 25% concentration. How many litres must be drained and then replaced by pure antifreeze to bring the concentration to 50% (the manufacturer's "safe" level).

LET  $x$  = AMOUNT OF PURE ANTIFREEZE  
USED (SAME AS AMOUNT OF 25% REMOVED)  
 $y$  = AMOUNT OF 25% ANTIFREEZE REMAINING

(A)  $x + y = 12$

(B) ANTIFREEZE EQUATION:  $x + 0.25y = 0.5(12)$   
 $x + 0.25(12 - x) = 6$   
 $x + 3 - 0.25x = 6$   
 $0.75x = 3$   
 $x = 4L$

4 Litres must be drained & replaced.

**Question 9.** Simplify the given expressions. (5 marks)

(a)  $\sqrt[3]{-27} = \boxed{-3}$  (because  $(-3)^3 = -27$ )

(b)  $16^{-0.5} = \frac{1}{16^{0.5}} = \boxed{\frac{1}{4}}$

(c)  $-16^{\frac{3}{2}} = -(\sqrt{16})^3 = -4^3 = \boxed{-64}$

(d)  $\sqrt[4]{81} = \boxed{3}$  (b/c  $3^4 = 81$ )

(e)  $\sqrt[3]{-64} = \boxed{-4}$  (because  $(-4)^3 = -64$ )