MATH 180 (16397) **Quiz 9 (Version 1) 03/31/06;** **Solution 02/23/06**

Name (print) _____ **Discussion hour (T Th ___)**

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1. (12 pts.) Let $A = 10x + 9y$, where $xy = 40$ and $x > 0$.

(a) Express A as a function of x.

Solution: $\boxed{A(x) = 10x + 9\left(\frac{40}{x}\right) \text{ (\textbf{4 points})}.}$

(b) Find the *critical points* of $A = A(x)$.

Solution: $\boxed{A'(x) = 10 - \frac{9{\cdot}40}{x^2} = \frac{10(x^2-36)}{x^2} \text{ (\textbf{2 points})}}$ so $\boxed{x = 6 \text{ (\textbf{2 points})}.}$ Note that $x = -6$ is ruled out since it is not in the domain of $f(x)$.

(c) Find the *minimum* of $A = A(x)$.

Solution: $\boxed{A(6) = 10{\cdot}6 + \frac{9{\cdot}40}{6} = 120. \text{ (\textbf{4 points})}.}$

2. (8 pts.) Suppose that $V = 5r^3$. Given that $\frac{dV}{dt} = 7$, find $\frac{dr}{dt}$ when $r = 2$.

Solution: $\frac{dV}{dt} = 5(3r^2\frac{dr}{dt})$ (**3 points**) so $7 = 15{\cdot}2^2\frac{dr}{dt}$ (**3 points**) and $\boxed{\frac{dr}{dt} = \frac{7}{60} \text{ (\textbf{2 points})}.}$

MATH 180 (16397) **Quiz 9 (Version 2) 03/31/06;** **Solution 02/23/06**

Name (print) _____ **Discussion hour (T Th ___)**

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1. (12 pts.) Let $A = 10x + 2y$, where $xy = 80$ and $x > 0$.

(a) Express A as a function of x.

Solution: $\boxed{A(x) = 10x + 2\left(\frac{80}{x}\right) \text{ (\textbf{4 points})}.}$

(b) Find the *critical points* of $A = A(x)$.

Solution: $\boxed{A'(x) = 10 - \frac{2{\cdot}80}{x^2} = \frac{10(x^2-16)}{x^2} \text{ (\textbf{2 points})}}$ so $\boxed{x = 4 \text{ (\textbf{2 points})}.}$ Note that $x = -4$ is ruled out since it is not in the domain of $f(x)$.

(c) Find the *minimum* of $A = A(x)$.

Solution: $\boxed{A(4) = 10{\cdot}4 + \frac{2{\cdot}80}{4} = 80. \text{ (\textbf{4 points})}.}$

2. (8 pts.) Suppose that $V = 7r^2$. Given that $\frac{dV}{dt} = 11$, find $\frac{dr}{dt}$ when $r = 3$.

Solution: $\frac{dV}{dt} = 7(2r\frac{dr}{dt})$ (**3 points**) so $11 = 14{\cdot}3\frac{dr}{dt}$ (**3 points**) and $\boxed{\frac{dr}{dt} = \frac{11}{42} \text{ (\textbf{2 points})}.}$