

end on a hot metal plate. At first the melting of the wax advances most rapidly on the bismuth bar, but when it has melted about an inch up the cylinder the iron overtakes the bismuth, and then the melting advances the more rapidly on the iron bar. Account

for these phenomena.

16. Describe an experiment which shows that the absorbing power of a surface is proportional to its radiating power for the same rays.

How do you account for the apparent radiation of cold?

SECOND CLASS AND INTERMEDIATE.—ALGEBRA.

July, 1880.

1. Find the value of $x^5 + x^4 - 166x^3 - 166x^2 + 81x + 81$ when $x = -7$; and the value of $x^3 - 3px^2 + (3p^2 + q)x - pq$ when $x = a + p$. (Arrange the latter result according to powers of a .) Value, 4+5.

2. What is the condition that $x + b$ shall be a factor of $ax^2 + bx + c$? Value, 4.

Find the factors of

(a). $(a^2 - ab) + 2b^2 - ab + 3(a^2 - b^2) + 4(a - b)z$ and (b). $(ax + b)(bx + c)(cx + a) - (ax + c)(bx + a)(cx + b)$. Value, 13.

3. What must be the relation among a, b, c , that $ax^2 + bx + c$ may be a perfect square? Value, 4.

(a). Extract the square root of $(a - b)^2 - 4(a^2 + b^2)(a - b) + 4(a + b)^2 + 8a - 8b$. Value, 5.

(b). If 5 be subtracted from the sum of the squares of any four consecutive numbers, the remainder will be a perfect square. (Prove this.) Value, 8.

4. If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f}$ and $\frac{h}{k} = \frac{l}{m} = \frac{n}{p}$ prove that $\frac{(a+c+e)(h+l+m)}{(b+d+f)(k+m+p)} = \frac{ah+cl+em}{bk+dm+fp}$ Value, 5.

(a). Reduce $\frac{ab(x^2 - y^2) + xy(a^2 - b^2)}{ab(x^2 + y^2) + xy(a^2 + b^2)}$ to its lowest terms. Value, 5.

(b). If $xy + yz + zx = 1$ prove that

$$\frac{x}{1-x^2} + \frac{y}{1-y^2} + \frac{z}{1-z^2} = \frac{4xyz}{(1-x^2)(1-y^2)(1-z^2)}$$

Value, 8.

5. Prove that

$$(a). \frac{2[x+2+\sqrt{(x^2-4)}]}{x+2-\sqrt{(x^2-4)}} = x + 1/(x^2-4).$$

Value, 5.

$$(b) (b+c-a)a^{\frac{1}{2}} + (c+a-b)b^{\frac{1}{2}} + (a+b-c)c^{\frac{1}{2}} = (a+b+c)(a^{\frac{1}{2}} + b^{\frac{1}{2}} + c^{\frac{1}{2}}) - 2(a^{\frac{3}{2}} + b^{\frac{3}{2}} + c^{\frac{3}{2}})$$

Value 5.

6. Solve the equations—

$$(a). (b-c)(x-a)^3 + (c-a)(x-b)^3 + (a-b)(x-c)^3 = 0. \text{ Value } 5.$$

$$(b). x+y=4xy; y+z=2yz; z+x=3xz.$$

Value 8.

$$(c). x+y+z=0.$$

$$ax+by+cz=0.$$

$$bcx+cay+abz+(a-b)(b-c)(c-a)=0.$$

Value 8.

$$(d). \frac{x-1}{x-3} + \frac{x-3}{x-1} + 2 = 0.$$

Value 8.

SOLUTIONS TO ALGEBRA PAPER.

1. Divide the ex. by $x+7$ by Horner's method, the rem. viz: (-02997) is the Ans.

Divide the ex. by $x-(a+p)$ by Horner's method, the rem. viz: $-a^3+aq-p^3$ is the Ans.

1. Divide x^2+bx+c by $x+b$ by Horner's method, then the rem. $ab-b^2+c$ must = zero.