MCR3U – Quiz #5

Full Name: SOLNS **Per:** 8 / 9

Date: November 2nd, 2023

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- Approved calculators are permitted
- Answers should belong to the real number set
- Answers should be exact unless otherwise stated

1. Solve the following quadratic equations

a) $(x-2)(x-1)+x(x-1)+1=-9x$

$x^2-3x+2+x^2-x+1=-9x$ ✓

$2x^2+5x+3=0$

$(2x+3)(x+1)=0$ ✓

$x=\frac{-3}{2}$ $x=-1$

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b) $x^2-2x=10$

$x^2-2x-10=0$

$x=\frac{2\pm\sqrt{4-4(1)(-10)}}{2(1)}$ ✓

$x=\frac{2\pm\sqrt{44}}{2}$ ✓

$x=\frac{2\pm\sqrt{4}\sqrt{11}}{2}$

$x=\frac{2\pm2\sqrt{11}}{2}$ 2

$x=1\pm\sqrt{11}$

2. Convert $f(x)=-2(x-4)^2+18$ to...

a) standard form

$f(x)=-2(x^2-8x+16)+18$

$=-2x^2+16x-32+18$ ✓

$=-2x^2+16x-14$ ✓

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b) factored form

$f(x)=-2(x^2-8x+7)$

$=-2(x-1)(x-7)$ ✓

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3. Convert $h(x)=5x^2+30x-4$ to vertex form

$=5(x^2+6x)-4$

$=5(x^2+6x+9-9)-4$ ✓

$=5(x^2+6x+9)-45-4$ ✓

$=5(x+3)^2-49$

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or AOS

$x=\frac{-30}{2(5)}$

$x=-3$

$h(-3)=5(-3)^2+30(-3)-4$

$=45-90-4$

$=-49$

$\therefore h(x)=5(x+3)^2-49$

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4. For what value(s) of k will the function $f(x) = 4x^2 - 8x + k - 3$ have two distinct real roots?

$D > 0$

$b^2 - 4ac > 0$

$(-8)^2 - 4(4)(k-3) > 0$

$64 - 16(k-3) > 0$

$64 - 16k + 48 > 0$

$-16k > -112$

$k < \frac{112}{16}$

$k < 7$

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5. Determine the nature of the roots: (circle one of the three possible answers)

a) $g(x) = 2x^2 - 9x + 11$ 2 equal real roots 2 distinct real roots (2 non-real roots) ✓

$(-9)^2 - 4(2)(11)$

$= 81 - 88$ $D < 0$

$= -7$

b) $f(x) = 2(x-3)^2 - 4$ 2 equal real roots (2 distinct real roots) 2 non-real roots ✓

(+) (−)

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c) $h(x) = -\frac{3}{4}(x-2)^2$ (2 equal real roots) 2 distinct real roots 2 non-real roots ✓

$k = 0$

d) $j(x) = 13x^2 - 13x$ 2 equal real roots (2 distinct real roots) 2 non-real roots ✓

$= 13x(x-1)$

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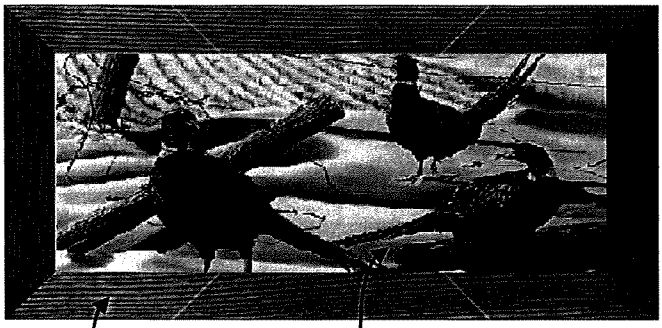
6. Mr. Lenarduzzi buys a new frame of uniform width for his pheasant painting which measures 27 cm by 81 cm. The painting fits perfectly inside the frame. If the total area of the frame is 1053 cm^2. What is the uniform width of the frame?



frame pheasant painting

Let x rep. the uniform width.

$$27(81) + 1053 = (27+2x)(81+2x)$$

$$2187 + 1053 = 2187 + 54x + 162x + 4x^2$$

$$0 = 4x^2 + 216x - 1053$$

$$x = \frac{-216 \pm \sqrt{216^2 - 4(4)(-1053)}}{2(4)}$$

$$x = \frac{-216 \pm \sqrt{46656 + 16848}}{8}$$

$$x = \frac{-216 \pm \sqrt{63504}}{8}$$

$$x = \frac{-216 \pm 252}{8}$$

$$x = \frac{36}{8} \quad \text{or} \quad x = \frac{-468}{8}$$

$$x = \frac{9}{2} \qquad \text{(INADMISSABLE)}$$

∴ The uniform width is 4.5 cm.

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7. A skier jumps off a cliff. The motion of the skier can be modeled by the function $h(d) = -0.2d^2 + 1.2d + 5.4$ where h is his height above the ground, and d is his horizontal distance from the cliff, both in metres.

a. How high is the cliff? 5.4m ✓

b. How far horizontally will the skier travel from the cliff before landing on the ground?

set $h = 0$

$$0 = -0.2(d^2 - 6d - 27)$$

$$0 = -0.2(d-9)(d+3)$$ ✓✓

$d = 9$

∴ The skier travelled 9m horizontally before landing.

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8. Fill in the chart for the function: $h(x) = 3x^2 - 12x + 9$

y-intercept	$(0,9)$ ✓
x-intercept(s)	$(1,0)$ $(3,0)$ ✓
Axis of symmetry	$x = 2$ ✓
Direction of Opening	opens up ✓
Optimal Value (min of ____ or max of ____)	min of -3 ✓
Vertex	$(2,-3)$ ✓

$0 = 3(x^2 - 4x + 3)$

$0 = 3(x-3)(x-1)$

$x = \frac{12}{2(3)}$

$x = 2$

$h(2) = 3(2)^2 - 12(2) + 9$

$= 12 - 24 + 9$

$= -3$

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9. Determine the point(s) of intersection of the functions $f(x) = 3x^2 + 11x - 8$ and $g(x) = -2x + 2$ algebraically.

set $f(x) = g(x)$ ✓

$3x^2 + 11x - 8 = -2x + 2$

$3x^2 + 13x - 10 = 0$

$(3x - 2)(x + 5) = 0$ ✓

$x = \frac{2}{3}$ $\quad x = -5$

$g\left(\frac{2}{3}\right) = -2\left(\frac{2}{3}\right) + 2$ ✓

$= \frac{-4}{3} + \frac{6}{3}$

$= \frac{2}{3}$ ✓

$g(-5) = -2(-5) + 2$

$= 12$

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∴ POIs are

$\left(\frac{2}{3}, \frac{2}{3}\right)$ AND $(-5, 12)$

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