

45

NAME:

Key

Note: there are 2 extra here. →

1. [5] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let f be a function, and x , y , and z be real numbers with $z \neq 0$.

(T) F The graph of $[[x]] + 2$ is the graph of $[[x]]$ shifted up 2 units.

T (F) $\frac{7x^2 + 7x}{x^2 + 2x + 2} = \frac{7x}{x + 1}$ where $x \neq -1$

$x^2 + 2x + 2^2$
~~(x+1)(x+1)~~
~~(x+1)(x+1)~~

~~2x/2x~~ $\cdot \frac{30.5m}{1ft} \cdot \frac{30.5m}{1ft} \cdot \frac{30.5m}{1ft}$
 $\approx 56,745cm^3$

(T) (F) Given that 1 foot is about 30.5 cm, we know 2 cubic feet is 61 cubic cm.

(T) F Given that 1 foot is about 30.5cm, we know 57 cm is about 1.87 feet.

(T) F To transform $y = x^2 + 5x - 7$ into vertex form, we can add $\frac{25}{4}$ to both sides.

$57cm \cdot \frac{1ft}{30.5cm} = 1.868...$
 $\hookrightarrow (\frac{5}{2})^2$

T (F) To transform $y = 2x^2 + 5x - 7$ into vertex form, we can add $\frac{25}{4}$ to both sides.

T (F) $(3 - 5i) - (3 + 2i) = -7i$

~~3-5i~~ ~~-3-2i~~ = ~~-2i~~ ~~-5i~~

need to buy the 2 so $\frac{1}{2}y = x^2 + \frac{5}{2}x - 7$
 so add $(\frac{5}{2})^2$ or $\frac{25}{4}$

Show your work for the following problems. The correct answer with no supporting work will receive NO credit (this includes multiple choice questions).

2. [3] (Aut15 Exam1 #2) Find $\frac{\frac{2}{x^2} - x}{x - 2} + \frac{3x - 5}{(x + 4)(x - 4)}$

$$x^2 \cdot \frac{2}{x^2} - x + \frac{3x - 5}{(x+4)(x-4)}$$

$$x^2 \cdot \frac{2}{x^2} - x + \frac{3x - 5}{(x+4)(x-4)}$$

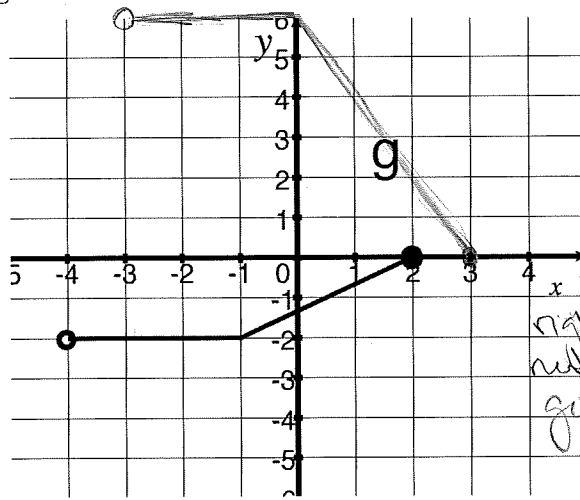
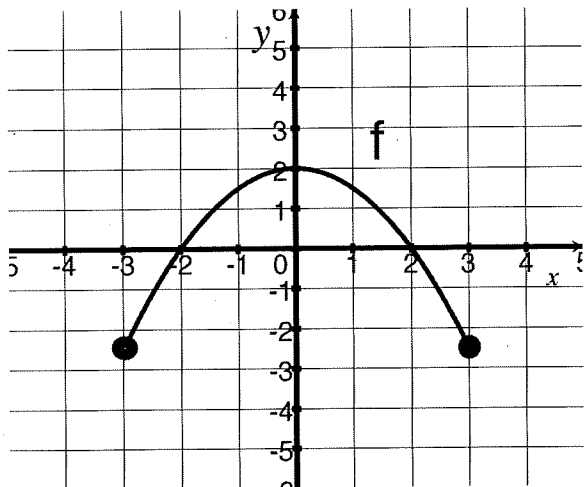
skipped (1.5)
 fraction in fraction (1)
 common denominator (1.5)
 added fractions (1.5)
 arithmetic/ratization (1.5)

$$\frac{(x+4)(x-4)(2-x^3)}{(x+4)(x-4)x^2(x-2)} + \frac{(3x-5)x^2(x-2)}{(x+4)(x-4)x^2(x-2)}$$

$$\frac{(x+4)(x-4)(2-x^3) + (3x-5)x^2(x-2)}{(x+4)(x-4)x^2(x-2)}$$

Note: not asked to simplify

3. Let f be the parabola with a restricted domain that is shown below on the left and g be the piece-wise defined graph on the right.



(a) [2] (WebHW3 #19) Find the domain of g

$-4 < x \leq 2$ or $(-4, 2]$

-4 (+.5)
2 (+.5)

x-values (+.5) notation (+.5)

(b) [2] Estimate the range of f .

$-2.5 \leq y \leq 2$ or $[-2.5, 2]$

-2.5 (+.5)
2 (+.5)

y-values (+.5) notation (+.5)

(c) [2] (CombineWks #2) Estimate $(f - g)(-2)$.

$(f - g)(-2) = f(-2) - g(-2) = 0 - (-2) = 2$

(d) [2] (§1.6 #28) Estimate $(f \circ g)(2)$.

$f(g(2)) = f(0) = 2$

composition (+.5)
got it (+.5)

(e) [3] (WebHW8 #7) Find the equation for f in the indicated form:

$f(x) = \begin{cases} -\frac{1}{2}x^2 + 2 & \text{if } -3 \leq x \leq 3 \end{cases}$

parabola w/ vertex (0, 2) (+.5) passes thru (2, 0) (+.5)
 $y = a(x - 0)^2 + 2$ (+.5)
 $0 = a(2)^2 + 2$
 $-2 = 4a$
 $-\frac{1}{2} = a$ (+.5)
 So $y = ax^2 + 2$

→ another (non-vertex) point

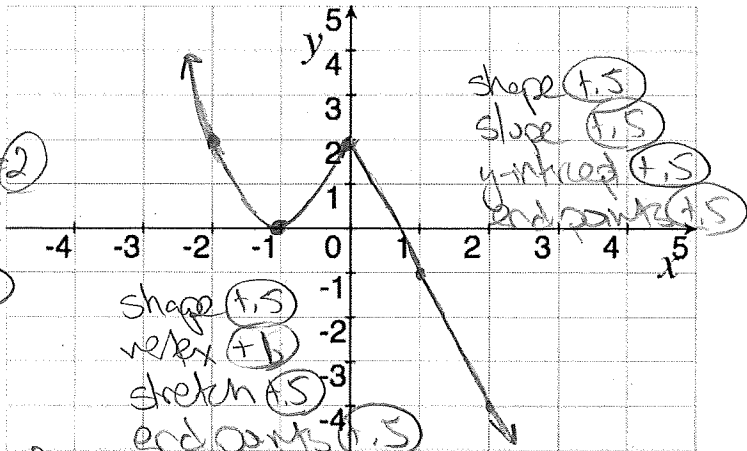
(f) [3] (transformationWks2 #3) Graph $-3g(x - 1)$ on the right axis above.

vertical sketch by -3
 2 ie. mult y-coord by -3 +1
 horiz shift right 1 unit +1
 partially

4. Let $h(x) = \begin{cases} 2(x+1)^2 & x < 0 \\ -3x+2 & 0 \leq x \end{cases}$

- (a) [1] (WebHW3 #18)
 Estimate $h(0)$ $0 \leq 0$
 use 2nd line $-3(0)+2=2$

- (b) [5] (Quiz2 #2)
 Graph h .
 plot a point $(0, 2)$



- (c) [1] (§1.1 #44)
 Find the x -intercepts
 i.e. when $y=0$

5. [3] (WebHW7 #3) Let $f(x) = \sqrt{x+1}$ and $g(x) = \frac{x}{3x+1}$. Find the domain of $(\frac{f}{g})(x)$.

$(\frac{f}{g})(x) = \frac{\sqrt{x+1}}{\frac{x}{3x+1}}$

den $\neq 0$ and $\sqrt{\text{rad}} \neq \text{negative}$

$3x+1 \neq 0$ $\frac{x}{3x+1} \neq 0$ $x+1 \geq 0$

get it (1.5)

$x \neq -\frac{1}{3}$ $x \neq 0$ $x \geq -1$

or $(-\infty, -1) \cup (-1, -\frac{1}{3}) \cup (-\frac{1}{3}, 0) \cup (0, \infty)$

6. [4] (Quiz1 #4) You have 8 oz of mocha that is 25% espresso sitting in a 16 oz cup. Write a rational expression that returns the percentage (in decimal form) of espresso in the mocha when straight espresso is added.

percentage of espresso = $\frac{\text{espresso oz}}{\text{mocha oz}}$ (1.5)

= $\frac{\text{original espresso} + \text{new espresso}}{\text{original mocha} + \text{added liquid}}$ (1.5)

= $\frac{.25 \cdot 8 + x}{8 + x}$ (1.5)

= $\frac{2 + x}{8 + x}$ (1.5)

$.25 \frac{\text{esp}}{\text{liquid}} \cdot 8 \text{ liquid} = 2 \text{ esp}$

where x is the amount of espresso you add (1)

$$\begin{array}{r} 22 \\ 23 \\ \hline 45 \end{array}$$

7. Let $p(x) = (x + 3)^2 + 1$

(a) [1] (§1.3 #32) Find $p(2+k)$. = $(\boxed{2+k} + 3)^2 + 1$
 = $(2+k+3)^2 + 1$

$(k+5)^2 + 1$
 $k^2 + 10k + 26$

(b) [1] Identify the vertex of $p(x)$.

$(-3, 1)$
 $(-3, 1)$

(c) [2] (§2.1 #92b) Find the real or complex roots of $p(x)$.

roots when $y=0$

$0 = (x+3)^2 + 1$

$-1 = (x+3)^2$ or

$\pm\sqrt{-1} = x+3$

$-3 \pm i = x$

roots when $y=0$

$0 = (x+3)^2 + 1$

$0 = x^2 + 6x + 9 + 1$

$0 = x^2 + 6x + 10$

$x = \frac{-6 \pm \sqrt{36 - 4(1)(10)}}{2(1)}$

alg (+1)

quad formula (+1.5)

8. [5] (§2.6 & §A.8 #51) The impedance Z varies directly with the voltage V and inversely with the current I . If the impedance is 2, and voltage is 12, then the current can be determined to be 6. If the impedance is $5 - 7i$ and the current is $2 + 5i$, what is the voltage?

$Z = \frac{kV}{I}$

stca (+1.5)

If $Z=2$ and $V=12$, then $I=6$

so $2 = \frac{k \cdot 12}{6}$

$\Rightarrow 2 = 2k \Rightarrow k=1$

Formula is: $Z = \frac{V}{I}$

$5 - 7i = \frac{V}{2 + 5i}$ find V

$V = 10 + 11i - 35(-1)$

$V = 10 + 11i + 35$

$V = 45 + 11i$

get it (+1.5)

$(2+5i)(5-7i) = \frac{V}{2+5i} \cdot 2+5i$

$10 - 14i + 25i - 35i^2 = V$