ATM Final Exam Review

In the following exercises, factor completely.

445. $80a^2 + 120a^3$

446. $5m(m-1) + 3(m-1)$

447. $x^2 + 13x + 36$

448. $p^2 + pq - 12q^2$

449. $xy - 8y + 7x - 56$

450. $40r^2 + 810$

451. $9s^2 - 12s + 4$

452. $6x^2 - 11x - 10$

453. $3x^2 - 75y^2$

454. $6u^2 + 3u - 18$

455. $x^3 + 125$

456. $32x^5y^2 - 162xy^2$

457. $6x^4 - 19x^2 + 15$

458. $3x^3 - 36x^2 + 108x$

In the following exercises, solve

459. $5a^2 + 26a = 24$

460. The product of two consecutive integers is 156. Find the integers.

461. The area of a rectangular place mat is 168 square inches. Its length is two inches longer than the width. Find the length and width of the placemat.

462. Jing is going to throw a ball from the balcony of her condo. When she throws the ball from 80 feet above the ground, the function $h(t) = -16t^2 + 64t + 80$ models the height, *h*, of the ball above the ground as a function of time, *t*. Find: ⓐ the zeros of this function which tells us when the ball will hit the ground. ⓑ the time(s) the ball will be 128 feet above the ground. ⓒ the height the ball will be at $t = 4$ seconds.

463. For the function, $f(x) = x^2 - 7x + 5$, ⓐ find when $f(x) = -7$ ⓑ Use this information to find two points that lie on the graph of the function.

464. For the function $f(x) = 25x^2 - 81$, find: ⓐ the zeros of the function ⓑ the *x*-intercepts of the graph of the function ⓒ the *y*-intercept of the graph of the function.

In the following exercises, simplify.

483. $\frac{4a^2b}{12ab^2}$

484. $\frac{6x-18}{x^2-9}$

In the following exercises, perform the indicated operation and simplify.

485. $\frac{4x}{x+2} \cdot \frac{x^2+5x+6}{12x^2}$

486. $\frac{2y^2}{y^2-1} \div \frac{y^3-y^2+y}{y^3-1}$

487. $\frac{6x^2-x+20}{x^2-81} - \frac{5x^2+11x-7}{x^2-81}$

488. $\frac{-3a}{3a-3} + \frac{5a}{a^2+3a-4}$

489. $\frac{2n^2+8n-1}{n^2-1} - \frac{n^2-7n-1}{1-n^2}$

490. $\frac{10x^2+16x-7}{8x-3} + \frac{2x^2+3x-1}{3-8x}$

491. $\frac{\frac{1}{m}-\frac{1}{n}}{\frac{1}{n}+\frac{1}{m}}$

In the following exercises, solve each equation.

492. $\frac{1}{x}+\frac{3}{4}=\frac{5}{8}$

493. $\frac{1}{z-5}+\frac{1}{z+5}=\frac{1}{z^2-25}$

494. $\frac{z}{2z+8}-\frac{3}{4z-8}=\frac{3z^2-16z-16}{8z^2+2z-64}$

In the following exercises, solve each rational inequality and write the solution in interval notation.

495. $\frac{6x}{x-6} \le 2$

496. $\frac{2x+3}{x-6} > 1$

497. $\frac{1}{2}+\frac{12}{x^2} \ge \frac{5}{x}$

In the following exercises, solve each rational inequality and write the solution in interval notation.

495. $\frac{6x}{x-6} \le 2$

496. $\frac{2x+3}{x-6} > 1$

497. $\frac{1}{2}+\frac{12}{x^2} \ge \frac{5}{x}$

In the following exercises, find $R(x)$ given $f(x)=\frac{x-4}{x^2-3x-10}$ and $g(x)=\frac{x-5}{x^2-2x-8}$.

498. $R(x)=f(x)-g(x)$

499. $R(x)=f(x)\cdot g(x)$

500. $R(x)=f(x)\div g(x)$

501. Given the function, $R(x)=\frac{2}{2x^2+x-15}$, find the values of x that make the function less than or equal to 0.

In the following exercises, solve.

502. If y varies directly with x, and $x=5$ when $y=30$, find x when $y=42$.

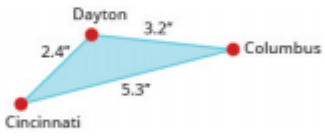
503. If y varies inversely with the square of x and $x=3$ when $y=9$, find y when $x=4$.

504. Matheus can ride his bike for 30 miles with the wind in the same amount of time that he can go 21 miles against the wind. If the wind's speed is 6 mph, what is Matheus' speed on his bike?

505. Oliver can split a truckload of logs in 8 hours, but working with his dad they can get it done in 3 hours. How long would it take Oliver's dad working alone to split the logs?

506. The volume of a gas in a container varies inversely with the pressure on the gas. If a container of nitrogen has a volume of 29.5 liters with 2000 psi, what is the volume if the tank has a 14.7 psi rating? Round to the nearest whole number.

507. The cities of Dayton, Columbus, and Cincinnati form a triangle in southern Ohio. The diagram gives the map distances between these cities in inches.



The actual distance from Dayton to Cincinnati is 48 miles. What is the actual distance between Dayton and Columbus?

In the following exercises, simplify using absolute values as necessary.

579. $\sqrt[3]{125x^9}$

580. $\sqrt{169x^8y^6}$

581. $\sqrt[3]{72x^8y^4}$

582. $\sqrt{\dfrac{45x^3y^4}{180x^5y^2}}$

In the following exercises, simplify. Assume all variables are positive.

583. ⓐ $216^{-\frac{1}{4}}$ ⓑ $-49^{\frac{3}{2}}$

584. $\sqrt{-45}$

585. $\dfrac{x^{-\frac{1}{4}}\cdot x^{\frac{5}{4}}}{x^{-\frac{3}{4}}}$

586. $\left(\dfrac{8x^{\frac{2}{3}}y^{-\frac{5}{2}}}{x^{-\frac{7}{3}}y^{\frac{1}{2}}}\right)^{\frac{1}{3}}$

587. $\sqrt{48x^5}-\sqrt{75x^5}$

588. $\sqrt{27x^2}-4x\sqrt{12}+\sqrt{108x^2}$

589. $2\sqrt{12x^5}\cdot 3\sqrt{6x^3}$

590. $\sqrt[3]{4}\left(\sqrt[3]{16}-\sqrt[3]{6}\right)$

591. $(4-3\sqrt{3})(5+2\sqrt{3})$

592. $\dfrac{\sqrt[3]{128}}{\sqrt[3]{54}}$

593. $\dfrac{\sqrt{245xy^{-4}}}{\sqrt{45x^{-4}y^3}}$

594. $\dfrac{1}{\sqrt[3]{5}}$

595. $\dfrac{3}{2+\sqrt{3}}$

596. $\sqrt{-4}\cdot\sqrt{-9}$

597. $-4i(-2-3i)$

598. $\dfrac{4+i}{3-2i}$

599. i^{172}

In the following exercises, solve.

600. $\sqrt{2x+5}+8=6$

601. $\sqrt{x+5}+1=x$

602. $\sqrt[3]{2x^2-6x-23}=\sqrt[3]{x^2-3x+5}$

In the following exercise, ⓐ find the domain of the function ⓑ graph the function ⓒ use the graph to determine the range.

603. $g(x)=\sqrt{x+2}$

529. Use the Square Root Property to solve the quadratic equation $3(w+5)^2 = 27$.

530. Use Completing the Square to solve the quadratic equation $a^2 - 8a + 7 = 23$.

531. Use the Quadratic Formula to solve the quadratic equation $2m^2 - 5m + 3 = 0$.

Solve the following quadratic equations. Use any method.

532. $2x(3x-2) - 1 = 0$

533. $\frac{9}{4}y^2 - 3y + 1 = 0$

Use the discriminant to determine the number and type of solutions of each quadratic equation.

534. $6p^2 - 13p + 7 = 0$

535. $3q^2 - 10q + 12 = 0$

Solve each equation.

536. $4x^4 - 17x^2 + 4 = 0$

537. $y^{\frac{2}{3}} + 2y^{\frac{1}{3}} - 3 = 0$

For each parabola, find ⓐ which direction it opens, ⓑ the equation of the axis of symmetry, ⓒ the vertex, ⓓ the x- and y-intercepts, and e) the maximum or minimum value.

538. $y = 3x^2 + 6x + 8$

539. $y = -x^2 - 8x + 16$

Graph each quadratic function using intercepts, the vertex, and the equation of the axis of symmetry.

540. $f(x) = x^2 + 6x + 9$

541. $f(x) = -2x^2 + 8x + 4$

In the following exercises, graph each function using transformations.

542. $f(x) = (x+3)^2 + 2$

543. $f(x) = x^2 - 4x - 1$

In the following exercises, solve each inequality algebraically and write any solution in interval notation.

544. $x^2 - 6x - 8 \leq 0$

545. $2x^2 + x - 10 > 0$

Model the situation with a quadratic equation and solve by any method.

546. Find two consecutive even numbers whose product is 360.

547. The length of a diagonal of a rectangle is three more than the width. The length of the rectangle is three times the width. Find the length of the diagonal. (Round to the nearest tenth.)

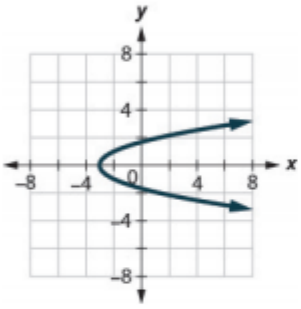
548. A water balloon is launched upward at the rate of 86 ft/sec. Using the formula $h = -16t^2 + 86t$ find how long it will take the balloon to reach the maximum height, and then find the maximum height. Round to the nearest tenth.

447. For the functions, $f(x) = 6x + 1$ and $g(x) = 8x - 3$, find ⓐ $(f \circ g)(x)$, ⓑ $(g \circ f)(x)$, and ⓒ $(f \cdot g)(x)$.

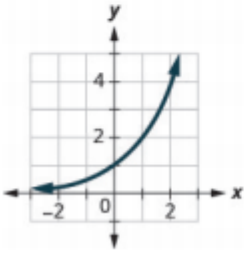
448. Determine if the following set of ordered pairs represents a function and if so, is the function one-to-one. $\{(-2, 2), (-1, -3), (0, 1), (1, -2), (2, -3)\}$

449. Determine whether each graph is the graph of a function and if so, is it one-to-one.

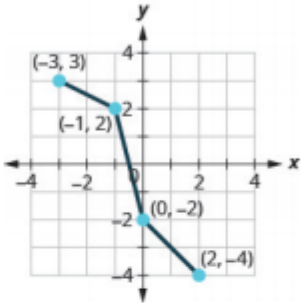
ⓐ



ⓑ



450. Graph, on the same coordinate system, the inverse of the one-to-one function shown.



451. Find the inverse of the function $f(x) = x^5 - 9$.

452. Graph the function $g(x) = 2^{x-3}$.

453. Solve the equation $2^{2x-4} = 64$.

454. Solve the equation $\frac{e^{x^2}}{e^4} = e^{3x}$.

455. Megan invested $\$21{,}000$ in a savings account. If the interest rate is 5%, how much will be in the account in 8 years by each method of compounding?

ⓐ compound quarterly

ⓑ compound monthly

ⓒ compound continuously.

456. Convert the equation from exponential to logarithmic form: $10^{-2} = \frac{1}{100}$.

457. Convert the equation from logarithmic equation to exponential form: $3 = \log_7 343$

458. Solve for x: $\log_5 x = -3$

459. Evaluate $\log_{11} 1$.

460. Evaluate $\log_4 \frac{1}{64}$.

461. Graph the function $y = \log_3 x$.

462. Solve for x: $\log(x^2 - 39) = 1$

463. What is the decibel level of a small fan with intensity 10^{-8} watts per square inch?

464. Evaluate each. ⓐ $6^{\log_6 17}$ ⓑ $\log_9 9^{-3}$

In the following exercises, use properties of logarithms to write each expression as a sum of logarithms, simplifying if possible.

465. $\log_5 25ab$

466. $\ln\frac{e^{12}}{8}$

467. $\log_2 \sqrt[4]{\frac{5x^3}{16y^2z^7}}$

In the following exercises, use the Properties of Logarithms to condense the logarithm, simplifying if possible.

468. $5\log_4 x + 3\log_4 y$

469. $\frac{1}{6}\log x - 3\log(x+5)$

470. Rounding to three decimal places, approximate $\log_4 73$.

471. Solve for x: $\log_7(x+2) + \log_7(x-3) = \log_7 24$

In the following exercises, solve each exponential equation. Find the exact answer and then approximate it to three decimal places.

472. $\left(\frac{1}{5}\right)^x = 9$

473. $5e^{x-4} = 40$

474. Jacob invests $14,000 in an account that compounds interest quarterly and earns 4%. How long will it take for his money to double?

475. Researchers recorded that a certain bacteria population grew from 500 to 700 in 5 hours. At this rate of growth, how many bacteria will there be in 20 hours?

476. A certain beetle population can double in 3 months $(A = 2A_0)$. How long will it take for that beetle population to triple?