Test 3 (Final)  

150 points = 21 points (1.1-2.7) + 24 points (3.1-3.8) + 105 points (4.1-4.5).

1. (7 points) (2.2.12) A pharmacist is to prepare 15 milliliters of special eye drops for a glaucoma patient. The eye-drop solution must have a 2% active ingredient, but the pharmacist only has 10% solution and 1% solution in stock. How much of each type of solution should be used to fill the prescription? Do not memorize the equation for the test. You need to know how to calculate the percentage of the active ingredient.

2. (7 points) (2.5.8) Solve the equation $3x^3 - 4x^2 - 27x + 36 = 0$.

3. (7 points) (2.7.9) Solve the inequality $x(2x + 3) \geq 5$.

4. (8 points) (3.2.31) Find the center and radius of the circle: $2x^2 + 2y^2 - 12x + 4y - 15 = 0$.

5. (8 points) (3.6.21) Given $f(x) = -2x^2 + 20x - 43$. (a) Express $f(x)$ in the form $f(x) = a(x - h)^2 + k$. (b) Find the maximum or minimum value of $f(x)$. (c) Sketch the graph of $f$ and label the $x$-intercepts.

6. (8 points) (3.7.33) Given $f(x) = \frac{x - 2}{x + 1}$ and $g(x) = \frac{x - 1}{x + 2}$. Find $(f \circ g)(x)$ and its domain.

7. (10 points) (5.1.7) Solve the equation $4^x - 3 = 8^{1-x}$.

8. (10 points) (5.1.25) Find an exponential function of the form $f(x) = bax$ that has the $y$-intercept 8 and passes through the point $P(3, 1)$.

9. (10 points) (5.2.23) For Pacific halibut, the number of fish $N(t)$ still alive after $t$ years is given by $N(t) = N_0 e^{-0.2t}$. Approximate the percentage of the original number still alive after 10 years.

10. (12 points) (5.3.13/15) Find the number, if possible. $\log_7 7^2$, $\log_4 (-2)$, $\log_5 125$, $\log_8 0.0001$, $\ln e^{2/3}$, $e^{2 + \ln 3}$.

11. (10 points) (5.3.33) Sketch the graph of $f$. (a) $f(x) = \log_4 x$, (b) $f(x) = 2 \log_4 x$, (c) $f(x) = 2 + \log_4 x$, (d) $f(x) = \log_4 (-x)$, (e) $f(x) = \log_4 (x - 2)$.

12. (12 points) (5.4.27) Solve the equation $\log_5 (x + 3) + \log_5 (x + 5) = 1$.

13. (10 points) (5.5.13) Find the exact solution. $3^{x+4} = 21^{3x}$.

14. (11 points) (5.5.20) Find the exact solution. $\log(x - 4) - \log(3x - 10) = \log(1/x)$.

15. (10 points) (4.1.21) Find all values of $x$ such that $f(x) > 0$ and all $x$ such that $f(x) < 0$, and sketch the graph of $f$. $f(x) = x^3 + 2x^2 - 4x - 8$.

16. (10 points) (4.2.3) Find the quotient and remainder if $f(x) = 3x^3 + 2x - 4$ is divided by $p(x) = 2x^2 + 1$. 

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